THE

ARCHITECT, ENGINEER,

AND

SURVEYOR;

FOR THE YEAR 1843.

LONDON:
JAMES GILBERT, 49, PATERNOSTER ROW.

BRITISH MUSEUM

PREFACE.

THE Preface of a book, to be consistent with its name, should prepare the reader for the contents of that to which it is attached. It may therefore be supposed, that it is the first thing written by an author; but this is very rarely, if ever, the case—it is most frequently the last. Authors do not possess so clear a notion of what they are going to write as of what they have written. The astronomer turns his telescope upon a little spot of the heavens, having some notion of the arrangement of its stars, for the purpose of defining their relative positions and comparative magnitudes, and in doing this he discovers many things of the existence of which he was before ignorant. So the author, having fixed the most powerful instruments of thought upon some subject he desires to explain to others, discovers facts or deductions before unknown to him. Could we take a transcript of the thoughts of an ingenious author upon any subject before he began to write, and compare it with what he wrote, we should be startled by the dissimilarity, and we doubt whether he would himself recognize the first image of his own mind. We know no better mode of doing this than by inducing such a man to write his preface before he writes his book. It is easy to imagine what a weight it would be upon the vigour of his intellect,—how the fear of inconsistency would curb and restrain the efforts of his imagination, and withhold him from the pursuit of the varied objects continually rising before him, and inviting his examination. No man ever did make the attempt without being soon conscious that the prologue must be written after the play. But if such be the case with a book the effort of an individual mind, it must be much more so with one which is the produce of many minds, and contains not only a great variety of opinions, but opinions contrary to each other. There is then no real inconsistency in writing that last which is intended to be read first. Some of our readers, however, will have examined all or nearly all our pages before this preface comes into their hands; but, as a periodical containing descriptions of works of art, and examinations of scientific subjects, is not like one destined only as the pastime of an hour, to be thrown aside as soon as it has afforded the promised quantity of amusement, we are willing to believe that this preface will find its proper place in the now perfect volume, and be long referred to as an introduction to our united efforts during the past year.

There are, we think, two or three novel features in this volume, which seem especially to claim our attention as pointing out the progress of the professions which the journal represents. The pages of a professional periodical may be considered a tolerably fair index of the subjects which at the time of publication engross the attention of that class, and consequently, in our own case, represent the progress of knowledge and the demands of society.

In the Architectural portion of this work there will be found a large number of papers translated from the Italian, French, and German languages. It might, perhaps, be supposed from this, that the art is in a more advanced state in those countries than in our own, and

that it is a tacit admission of the superiority of our continental neighbours. But such a circumstance does not admit of this as a necessary supposition, whatever may be the fact. It is an evidence of the great interest which is now taken in the advancement of the art in this country. The narrow prejudices and ignorant pride which once induced an English architect to believe that nothing really good or great could be found beyond the range of his native shores, excepting in the classic lands of Greece and Rome, have been destroyed, and with a cultivated eye and candid judgment, he now seeks in the buildings of other countries for accessions to his knowledge and skill. A new field of Archæological research, almost a new School of Art, has been consequently opened to the British Architect; and it has been our desire, not only to aid the research, but also to cultivate in the minds of our readers a suitable anxiety for the pursuit. There is no highly civilized country of Europe which does not offer us some models superior in their kind to what can be found in other nations. If styles of architecture are the results of national peculiarities, and the circumstances of climate and political constitution, it is strange there should be a development of taste and skill essentially different in countries to which there is no natural boundaries; and it is still less remarkable where great natural divisions separate nations, and a difference of family and tongue has created jealousy, distrust, and too often hatred. The British artist above all others needs to be freed from his isolated restraint, and to be brought into the midst of the works of other men; for, however excellent may be the models on his own soil, there are elegancies which it does not possess, and beauties it cannot surpass. Even in a national point of view, a community of mind between the people of different climes and obeying different laws is of more moment than can be anticipated, having a tendency to prevent the outbreak of popular hereditary prejudices, and preserving the peace now so happily existing between the countries of Europe. But, confining our attention simply to the advantage to be derived from a more extensive acquaintance with the Architecture and Arts of other countries, we shall continue to draw the attention of our readers to the most important buildings which those countries possess, and the improvements in style, decoration, and construction which may be introduced.

The conviction of the necessity of an acquaintance with the Architecture of other countries than Greece and Rome, has been slowly forcing itself upon the British Artists for many years past; but the intense interest now felt in all that concerns foreign art, is mainly to be attributed to the attempt shortly to be made to introduce frescoes in the decoration of public buildings. And here we cannot avoid an allusion to the Cartoons produced during the past year by our Artists, and publicly exhibited subsequent to the award of the prizes. It is not asserting too much to say, that it was an exhibition of which we may be more justly proud than of our conquests and bloodshed; and that it was a demonstrative proof that the national skill in arts is not inferior to its prowess in arms.

The success with which the study and practice of Gothic Architecture have been revived, is also a source of congratulation to the profession and to the national taste. So thoroughly has the spirit of the designs of the Middle Ages been embodied in some of the churches and public hospitals completed during the last year, that they are scarcely inferior to the many noble relics of the skill of our forefathers. But while we encourage the study of this spirit-

awing style, we are bound to throw out a caution against the opinions of those enthusiasts, who would not hesitate to banish all other modes for its introduction in every erection to which architectural taste can be applied.

In the Engineering portion of this volume, a new class of subjects has been introduced, and one with which the professional men of this country are not generally acquainted. There has long been a singular want of attention, not only to the improvement of Rivers and Harbours, but also to the provisions for Drainage and Sewage, so common in many countries of Europe far behind our own in all other Engineering knowledge and skill. The great railway trunks which have established a new mode of inland traffic, being now almost completed, the talent and industry which that emergency called forth, have been during the past year wanting employment. A great depression in the trades dependent upon the Engineering science of the country has been the result, and in the present state of Europe and of its foreign countries, it would be useless to express an opinion upon the prospect of a revival. Under these circumstances we have directed the attention of our readers to those subjects which, in our opinion, most require the science and skill of the Engineer. We have, perhaps, in this, gone before the strongly-expressed public feeling which carries great national questions, and a large number of our readers may be of opinion that we have devoted too many of our pages to Hydraulic Engineering; but we shall not long require the proof that this is the subject to which the attention of our men of practical science will be next directed—a subject as important to the interests of the country, in its internal commerce, as to the safety of its shipping and coasts. It would be foolish and presumptuous to fix a value upon our own labours; but we believe that the body of evidence upon some of our most important harbours, and upon the general questions of the improvement of rivers and a system of drainage, much of which is contained in reports obtained with difficulty, and never before printed, will give an unusual value to this volume.

It is more difficult to speak of the future than of the past, and it is less necessary. A sincere desire to render the work useful to the Professions, and consequently to the public, has ever been the actuating motive of the conductors of this Journal, and will continue to be the only object of "THE ARCHITECT, ENGINEER, AND SURVEYOR."

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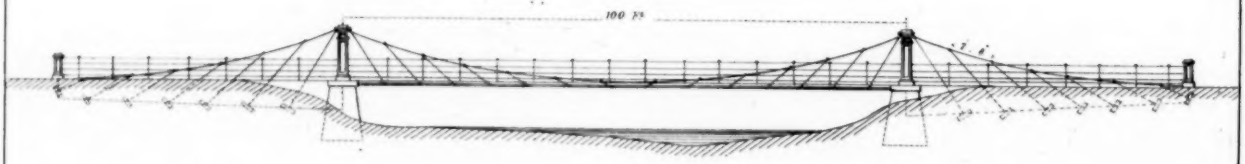
SUSPENSION BRIDGE, ERECTED FOR C.S. HARCOURT, ESQ^re AT WRAYSBURY.

BY J^n DREDGE, BATH.

ELEVATION

Fig. 1.



PLAN

Fig. 3.

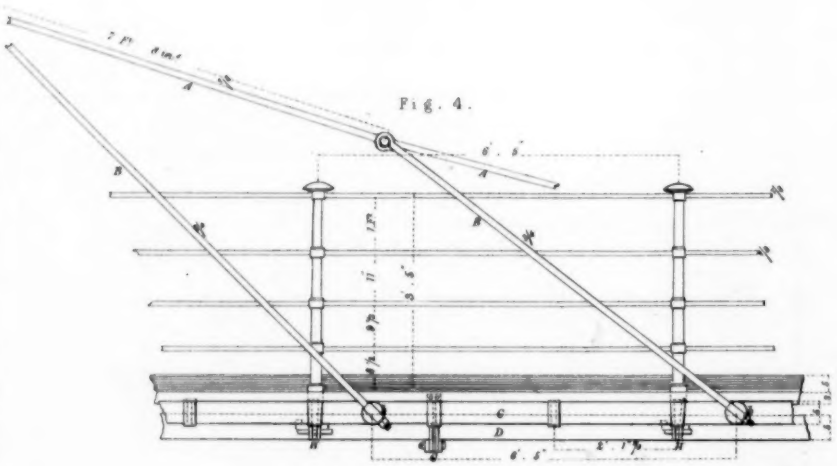


Fig. 4.

SECTION

Fig. 2.

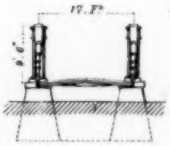
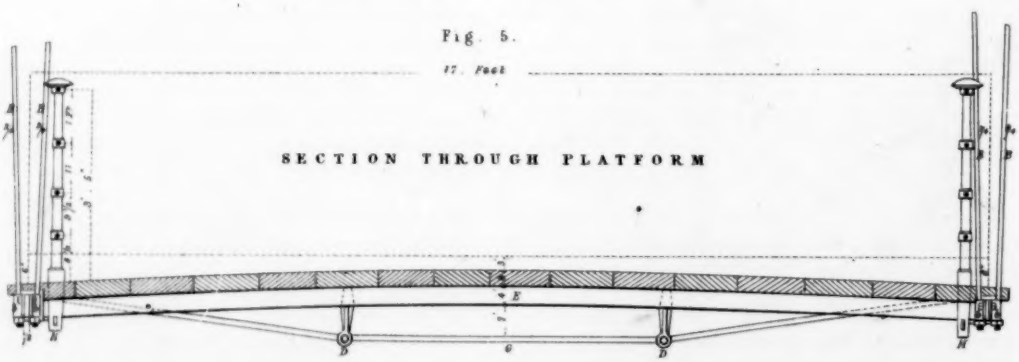
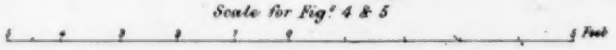


Fig. 5.



Scale for Fig^s 1. 2 & 3

Scale for Fig^s 4 & 5



J.R. Jobbins, Lith. 3, Warwick Ct.

THE ARCHITECT, ENGINEER, AND SURVEYOR;

OR,

LONDON MONTHLY JOURNAL OF ENGINEERING AND THE PRACTICAL SCIENCES, AND OF ARCHITECTURE AND THE FINE ARTS.

ADDRESS.

In commencing the Fourth Volume of this Work, and with it a New Series, it seems incumbent on the present Editors to take a review of the past, and to inquire how far experience may assist them in improving its professional character and usefulness. A periodical publication addressed to any class of professional men is only useful as it becomes a medium for the expression of individual opinion, and at the same time a record of the general passing information required by the practitioner. From the commencement of this Journal its pages have been always open to the communications of its Subscribers, and a great variety of valuable original essays have appeared. New connections have now been formed, in addition to the contributors who have hitherto afforded their valuable assistance, and the Editors feel justified in encouraging the expectation, that the future numbers will contain essays from men of science and of art, which cannot fail to secure and extend the approbation of the public. That it may be the impartial record of professional opinion, and of public works, will be the constant effort of the Editors, who, by a candid consideration of the communications they receive, and a watchful jealousy over the rights of individuals and classes, hope to render the Journal of great value to the Architect, Engineer, and Surveyor.

It is the intention of the present conductors to devote the work as much as possible to those subjects which may be of most interest at the several periods of publication. For this purpose they will avail themselves of every opportunity of collecting that general information so indispensable to the man of business. But, fully to secure this important subject, they must receive the co-operation of their correspondents and subscribers.

In addition to the subjects of local or national interest, the Editors will endeavour to collect information upon foreign works; and translations of valuable essays from continental publications will frequently appear.

The slight alteration which has been made in the title of the Journal is hardly worthy of remark, but as the work is intended to be the impartial organ of the three professions, an alphabetical order of the names seemed desirable.

SUSPENSION BRIDGE ON MR. DREDGE'S PRINCIPLE, ERECTED FOR G. S. HARCOURT, ESQ., AT WRAYSBURY.

(*With a Plate.*)

This bridge was erected in September last by Mr. Dredge, upon his patented principle. It is situated in the parish of Wraysbury, near Runymede, across a stream, which, though of trifling amount in summer, is increased by the rains of winter to one of considerable magnitude. It was built at the expense of G. S. Harcourt, Esq., in the line of road lately altered, leading from Slough to Staines.

The piers are built in a peat marsh, with a good under stratum of firm gravel, upon which the foundations are laid, about eight feet below the surface. In digging through the peat for the foundations, several horse-shoes were thrown up, which appear from their form to be of great antiquity. Although they must undoubtedly have lain in this place a number of years, it is remarkable that they are as free from oxide as when dropped from the horses' feet, not a particle of rust being perceptible upon them; indeed, on the inner surface, not even the smith's hammer marks are obliterated. The span of the bridge, or diameter between the points of suspension of the main chains, is 100 feet: they rest upon cast-iron towers, 9 feet 7 inches high, firmly fixed to the block stones upon the piers of brickwork, which are carried up to the level of the roadway of the bridge. The chains are formed of links of round iron, $\frac{3}{4}$ of an inch in diameter, and 7 feet 8 inches long, put together in the way already described in a former number of this Journal, and as shown in the plate, figs. 4 and 5.

Two oblique rods, three-quarters of an inch in diameter, descend from each joint in the chain to support the platform, and are attached to the beams by cast-iron plates. This mode of fastening is simple, and is represented on a larger scale in the sections, figs. 4 and 5, the letters in both referring to the same parts.

Fig. 4 is a longitudinal, and fig. 5 a transverse section.

A A, one of the main chains of support.

B B, the oblique rods depending from the joints of the chains to suspend the platform. They are secured to the wrought-iron beam C by two circular cast plates *b b*, each having a raised tube through the diameter large enough to allow the oblique rod passing though it to be secured on the under side by a nut and screw; these plates are placed in pairs, one on each side of the beam C. There are fourteen of these pairs of plates, placed at intervals of 6 feet 5 inches. They are fastened to the beam by screwed bolts, in such a position as will accommodate it to the obliquity of the suspending rods.

The beam C is of wrought-iron, 5 inches by half an inch, running from end to end the whole distance between the piers on each side of the bridge. To these beams are connected, by means of cast boxes, the transverse beams E, forty four in number, each 2 feet 1$\frac{1}{2}$ inches apart, i. e., allowing three to occupy the space between the points of support in the beam C; these transverse beams are slightly curved upwards, presenting a convexity in the roadway of about 3 inches. Every third beam throughout the bridge is trussed with a suspension truss G, the ends of the rods being secured by screw bolts through those boxes which connect the trussed tranverse beams to the beam C, and which are made longer for that purpose, as may be seen indicated in fig. 4; the trusses are 6 feet 5 inches apart, but in order that the whole series of beams may participate in the advantage, two other beams D D, four inches deep by half an inch thick, run from end to end of the bridge, parallel with the beam C, resting, by means of castings, on the joints of the trusses, and supporting the beam E. This is a great advantage to the roadway, inasmuch as it reduces the length of the transverse beams from 17 feet, the width of the bridge, to 5 feet 8 inches, the distance between the

43. 1. 12. 22.

supports afforded by the trusses, and thus renders it inflexible transversely. The roadway is planked with Dantzic deck deals, and secured by staples to the beams beneath.

The railing is simply a running fence, with cast-iron standards, 6 feet 5 inches apart, which are keyed to every third beam in the manner shown at n, figs. 4 and 5.

For fastening the land ties the oblique rods leave the chains in the same manner as between the towers, viz., two from each joint; they are also three-quarters of an inch in diameter until they reach the ground, and are then increased to one inch in diameter. This increase of size is intended to allow for any oxidation that may take place below the surface, so that at any time the strength may not be less there than in any other part; but, as the iron which was thrown up after lying in the ground for so many years is perfectly free from rust, there appears to have been little occasion for such precaution. The bars there are of the same obliquity as in the bridge: they pass through and are secured to large blocks of stone, which are firmly embedded in the soil to the depth of 5 feet below the surface near the towers, and 3 feet at the extremity of the chains. It will be here observed, that instead of having only four points to depend upon to resist the weight of the bridge, there are thirty-two, so that if each of these points be held down with a pressure of only five tons, (though in all probability five times that would not be sufficient to move either of them,) there is an abutment sufficient to resist a force of $32 \times 5 = 160$ tons, and this is distributed over thirty-two points, with a pressure of five tons on each, instead of depending only on four, with a pressure of forty tons on each, which would be required to afford the same strength as at present.

The gravel covering of the planks weighs about four or five tons, and has been placed there merely to deaden the sound for horses in passing.

Before leaving the manufactory, all the bars were proved to the extent of ten tons per square inch. Mr. Dredge estimates the strength of the bridge at about 110 tons, of which, after deducting 20 tons, the gross superadded weight, namely, the whole of the iron, wood work, and gravel between the towers, there is left a power of 90 tons, or 118·6 lb. per square foot, for a transit or a permanent load, which is much greater than under any circumstances can ever be placed upon it.

From experiments made by Dr. Reid, it appears that 79 men could be packed into a space of 81 square feet, so that each square foot would be pressed by nearly the weight of a man, or say on the average with about 145 lb. No crowd, however, could exist in this state, which would prevent all kind of motion in any of the limbs; and, accordingly, it has been found that in the densest crowds each individual occupies about three square feet, so that no more than three can stand in a square yard. From this it follows that no crowd which could come on the bridge would produce a pressure equal to 50 lb. per square foot, which is less than half the force with which each bar has been tested.

SPECIFICATION OF STEAM BOATS FOR THE ROYAL MAIL STEAM PACKET COMPANY.

[The unenviable notoriety which the West India Mail Company has acquired gives an interest to its operations beyond what properly belongs to them. Under any circumstances, a specification from which fourteen steam vessels have been built must be an interesting document, but the following one is chiefly so from the disastrous issue of the enterprize, in which those vessels were engaged, an event in a great measure attributable to their construction. In this point of view the document is to the ship-builder what a chart is to mariners—a guide in difficult navigation.]

Contract agreed upon the ——— day of ———, in the year ———, by and between ———, ship-builders, on the one part, and ——— on the other part, as follows, that is to say, First, that the said ——— doth hereby for his heirs, executors, and administrators, covenant, contract, and engage, at their own cost and charges and expenses, to build in their yard at ———, in a substantial and workmanlike manner, and with good, sound, and proper materials of every kind, to be approved of by such officer or officers as shall be from time to time appointed by ——— to superintend the same—

A steam vessel of 1285 14-94 tons, agreeable to draught, delivered to ——— for that purpose, and in the manner and according to the conditions, dimensions, and scantlings as follows:

	ft.	*in.*
Length of keel for tonnage	181	4½
,, between perpendiculars	207	
Breadth, extreme	36	6
,, moulded	35	9
Depth in engine-room	20	
Burthen in tons	1285	14-94

Keel. Elm, sided in midships, 1 ft. 3 in.; at fore end, 1 ft.; at post abaft, 11 in.; whole wood to be left below rabbit, 3 in. The scarfs to be 4 ft. 6 in. long, dowelled; the lips not less than 3½ in., put together with felt, the felt well saturated with pitch and tar (one-third pitch), mixed warm, and bolted with six copper bolts, ⅞ diameter, well clenched on a ring at each end.

Side Keels,—of elm, to be shown in section, 1 ft. 4 in.

Stem.—English oak, sided at the head, 1 ft. 4 in.; moulded, 1 ft. 4 in.; before the rabbit, 6 in.

Stemson.—English oak, sided same as stem, and moulded at the head, 1 ft.

Stern Post.—English or African oak, square at head, 1 ft. 4 in.; fore and aft at the keel, 1 ft. 9 in.; abaft the rabbit at upper part of keel, 6 in.; on the keel, 9 in.

Inner Post.—English or African oak. In the keel, 1 ft. 4 in.; at the head, 9 in. Room and space as shown in draft.

Floors. English oak, sided in midships sufficient to fill the openings, not less than 1 ft. 2 in.; fore and abaft, not less than 1 ft.; moulded at the cutting down in midships, 1 ft. 3 in.; at the heads, 1 ft. 1⅛ in.

Half Floors.—English oak, sided, amidships, 1 ft. 1 in.; fore and aft, 11 in.; moulded at heads, 1 ft.

Futtocks.—Lower, English oak, sided, amidships, 11 in.; fore and aft, 10 in.; moulded at the heads, 10½ in. Second, English oak, sided, amidships, 10 in.; afore and abaft, 9 in.; moulded at the heads, 9 in. Third, English oak sided, 9 in.

Top Timbers.—Larch, mahogany, or Dantzic fir, sided from station 16 to station r, 9 in.; those in wake of paddle beams to be of English oak sided, 10 in., and made solid with fillings of oak (English or African), with felt between the fraying surfaces, under the beams; sided afore station r and abaft station 16, if oak, 8 in.; to taper from gunwale to rough tree rail, as shown in the drawing, to 6 in.; moulded at gunwale, 5½ in.; those from paddle beam to paddle beam, 6 in.

Knight Heads.—English oak, to be dowelled to and bolted across

the stem, and through each other, with felt, well paid with pitch and tar between the fraying surfaces, the bolts to be copper, and well clenched on a copper ring at each end, to be in diameter 1 in.; the knightheads to be sided, 1 ft. 1 in.

Kelsons.—English or African oak. The scarfs to be 5 ft. in length, and the lips 4 in., dowelled, sided, in midships, 1 ft. 3 in.; to taper forward to 1 ft., abaft, 11 in.; moulded, in midships, 1ft. 6 in.; afore and abaft (moulded), as in drawing, bolted with one copper bolt in every floor timber through the keel, and carefully clenched with a ring on each end, diameter 1¼ in.

Side Kelsons.—English or African oak, as shown in sections, sided, 1 ft.; moulded, 1 ft. 3 in.; bolted through every half floor and side keel, bolted with one copper bolt, and well clenched with a ring, and athwartships through the kelson, and 1 in. through each other, with bolts of the same description.

Wales.—English oak, thick, in midships, 7 in.; if of African oak 6½ in.; at the fore end, 5½ in.; and at the after ends, 4½ in.; from the upper edge to diminish to the under side of the shearstrake, as shown in section; may be of larch or Dantzic fir, except in midships, in wake of paddle-wheels, which is to be of English oak, 5 in.

Shear Strakes.—English oak, thick, 5 in.; upper strake, scored, 3 in.; and let in between the timbers to meet the water way, with felt between, as shown in the section; afore and abaft, English oak 8 in.; both strakes to diminish to 4 in., on the timbers, both before and abaft, exclusive of the scores. Round the stern to be wrought on oak plank, 3 in.

Diminishing Stuff, under the wales, English oak, to taper, as shown in section, to thickness of bottom.

Bottom.—Dantzic fir or larch, thick 4½ in.

Butt Bolts—in bottom, every bolt to be driven through the butt of each plank and well clenched on a ring at each end of the bolt, ¾ in.

Gunwale.—England or African oak, fitted with a rabbit on the under side of both edges, inside and out, to stop the caulking from passing through, as shown on section, thick 6 in.

Iron Stanchions.—To have iron stanchions, fitted on the gunwale with a rail as a bulwark to receive a netting, as shown in drawing.

Spardeck shelf, English oak in wake of paddle-boxes and round the bows and stern; the remainder may be larch or Dantzic fir, midships, 9 in.; afore and abaft, 8 in.; deep, 1 ft.; dowelled to timbers, as shown on drawing, and bolted with iron bolts, except those in wake of paddle boxes and in the bows, which are to be copper, all to be well clenched on a ring at each end, 8 in.

Upper or Main Deck shelf,—as shown on section, English or African oak, thick in midships, 1 ft. 1 in., to taper fore and aft to 9 in.; deep, 1 ft. 3 in.; dowelled to timbers, as shown on drawing, bolted with iron bolts, except those in the bows, and in the wake of the paddle-boxes, which are to be copper; diameter of bolts 1 in., well clenched on a ring at each end of bolt.

Breast Hooks.—Iron. Long, 14 ft.; broad at middle, 5 in.; ends, 3½ in.; bolted with twelve copper bolts, the four nearest the throat 1¼ in. diameter, and the other eight 1 in. diameter.

Lower Deck Shelf,—as shown on section, dowelled and bolted same as upper deck; all the bolts to be of copper, 1 in.

Deck Hooks.—English oak, long, as shown on drawing, and sided the same as the mouldings of the beams, and bolted with copper bolts, diameter 1¼ in.

Beams, Spar Deck,—to be single piece beams, to round 6 in. in the whole length, sided, 7 in.; moulded in middle, 6 in; at ends, 5 in.; those over engine-room, African oak, in one piece, sided, 7 in.; all afore and abaft engine room may be Dantzic fir, or larch in one piece, except such as may be marked on the drawing of oak.

Beams.—Main or upper deck. To round in whole length, 5 in.; sided, 1 ft.; moulded in middle, 11 in.; at ends, 9 in. English or African oak of the first quality for after bulk head of engine-room to bow of vessel, 11 in.; from said bulkhead, aft, to be oak, larch, mahogany, or Dantzic fir, as may be marked on the drawing, and as many as can be got of one piece, 9 in.

Beams Lower Deck.—Between engine-room bulkheads, of English or African oak, those forward and aft of engine-room to be of oak, larch, mahogany, or Dantzic fir, those of oak to be marked on drawing, 11 in.; sided, 11 in.; moulded, 11 in.; at ends, 9 in.; to round on their whole length, 2½ in.; those in engine-room, square, 1 ft., may be reduced at their ends, moulded way to 11 in.

Combings.—English or African oak. Height above deck as shown in drawing, those over engine-room to have hatches fitted with lids and scuttles for air.

Waterway.—Spar deck, as described by the section, to be of Dantzic fir, or larch.

Spar Deck,—flat, to be of good round Prussian deals, free from shakes and sap, clear of large knots, and well seasoned, 3 in.

Upper, or Main Deck,—flat, same as spar deck.

Strake above Waterway,—scored in between the timbers half-way, to meet the shear strake, as shown in section; waterway to be of English oak, in wake of the paddle-boxes, dowelled over the beams, and dowelled to the timbers all the way, fore and aft.

Main Beams,—for paddles, English or African oak, sided, 8 in.; moulded in middle, 1 ft. 10 in.; at ship's side, 1 ft. 10 in.; at ends, 1 ft. 8 in.

Iron Knees,—under main beams: the under knee, weight about 8 cwt., as shown on section; inner knee, weight 3 cwt., 3 qrs.

Braces or Diagonal Stays,—outside the main beams; outside one to each beam, weight, 2 cwt. 3 qrs. each.

Diagonal Plank.—Inside, English or African oak. Broad, amidships, 11 in.; fore and aft, 9 in.; thick, amidships, 6 in.; afore, 5 in.; abaft, 4 in., as shown on the drawing; to be careful that the butts are well stayed, and secured at each end with a copper bolt, clinched with a ring on each end.

Clamp.—Under shelf in midships, English or African oak, dowelled to the timbers, as shown in drawing; thick, 8 in.

Thick stuff under the Clamp.—English or African oak, in engine-room, afore and abaft may be larch, or Dantzic fir, from 7 to 5 in. thick, and quite aft round the stern, to diminish to 4 in. thick.

Iron Riders,—wide, 4½ inches, let into the timbers ½ their thickness, and bolted with copper bolts, from 2 feet above the load water line downwards; all bolts above on the top side may be iron, ¾ in. diameter.

Riders. Thick, in engine room, ¾; at turn of bilge 1 in.; at the upper ends reduced to ¾; afore and aft ¾, and bolted with bolts ¾, and in turn of bilge with copper bolts ⅝; all the bolts to be clinched with a copper ring on the riders, and on the plank of bottom outside; one bolt in every timber, as shown on the profile drawing.

Garboard or Side Keels—to be of English oak, or African oak, on Mr. Lang's plan for safety, as thick as the forms of the body will admit, dowelled to the sides, and bolted across the keel through each other, with copper bolts 1 in., and up and down through the timbers of the bottom with bolts of the same description and size, through the side kelsons, and to be clinched on a copper ring at each end of the bolts; to have adhesive felt on the fraying parts, against the side of the keel, of Messrs. Borradaile's manufacture,

well saturated with tar and pitch, the whole of which compasses the safety of keels, and secures the bottom of the ship from danger.

Iron Crutches,—as will be shown on the profile drawing; weight about 2½ cwt., bolted with copper bolts of 1 in. in diameter, and well clinched on copper rings on each end of bolt.

Iron Knees.—Under upper deck beams placed as shown on profile drawing, bolted on the beam arm with four iron bolts, two at the end, ⅞ in., and two nearer the throat, 1 in.; the side arm two of ⅞ in the ears, three of 1 in., and the ⅞ diameter; copper all above to be of iron, except in wake of paddle-wheel, and round the bow; weight of knees about 1¾ cwt.

Planks of the bottom—to be secured with a through bolt of copper in every butt, well clinched on a ring at each end of the bolt, and one trenail to be driven in every timber where any fastenings are required; between the bolts in the iron riders and wood trussing, a copper spike or bolt nail may be used occasionally to draw the plank home to the timbers, as the case may be, the nail or bolt to be 9½ in. long; no trenail to be bored for or driven before all the iron riders are bolted, to prevent the strength of the timbers being cut away by unnecessary holes and useless fastenings; butt bolts to be ¾ in.

To be filled in solid in the engine-room, with good dry English oak, and afore and abaft being good dry larch, mahogany, cedar, or Dantzic fir, about the height of the turn of the bilge in midships, as shown in the section, and to be continued all the way, fore and aft, to a fair line, to fill up solid all the way to the paddle beams; the fillings to be put in with adhesive felt, on Mr. Lang's plan, the felt to be placed on each side to prevent infection from timber or fillings, and to act as a caulking for a security to the bottom against water, in case the planking should be carried away by the ship's striking the ground; and where the timbers form a close joint, felt is to be placed between the fraying parts, to be well payed, as before mentioned, previous to the plank of the bottom being wrought on; the fittings to be less than the mouldings of the timbers, about 2 inches, leaving a water-course, as shown in the section on the inside; the felt to be of Messrs. Borradailes; the inside trussing and thick stuff to be of English or African oak, as shown on the drawing; the copper bolts and copper fastenings to extend as high up as 2 feet above the water-line, when the ship is loaded to 15 feet water. The two upper bolts in the of the head to be of iron, all below to be copper; to be copper fastened in the wake of the paddle-wheel, and in the bows, all the way to the top of the side, that is, all the through bolts; all the internal fastenings to be of iron, except the side kelsons, and such parts as are connected with the flat in the hold, where the hot water from the boilers is likely to cover.

All the materials to be good, sound, free from sap and defects, of the best quality, well seasoned, and well wrought, and no deviation to be made in any case; to build all cabins, store rooms, &c.; to perform all the joint-work, skylights, companions, and ladder-ways; to fit tube scuttles in the ship's sides for light and air, of Mr. Lang's invention, as is usually done in all ships and vessels for ventilation between decks; the said scuttles to be provided at the expense of the owners; to have all necessary combings and head-ledges, ladder-ways, gratings, and hatchways, as shown in the drawings; capstan, windlass, and C J hawse pipes, for the chain cable; two hawse pipes on each side afore, and one on each side abaft, in the stern. Iron compressors, and three stopper bolts on each side, on deck flat; the rings of stopper bolts to be 8¾ in. in the clear, and the diameter of iron 1⅛ in.; the skylights to be fitted with thick plate glass, and guarded with metal guards. The flat of all the decks to be fastened with mixed metal nails, and to be wrought with good clear edges, free from sap, strakes, or any defects; to have proper hatches fitted over the engine-room; the lids to be left with copper hinges, as shall be directed, and glass prisms fitted thereon, to admit light in bad weather, when the hatches are closed.

The lower deck and platform to be Prussian deals, fitted as shown on the drawings; lower deck 2½ in. thick; platform, 2 in.

The cabins and store rooms, as described in the plans; the bulk-heads to be dowelled, and opened with balustrades and jalousies, as is practised in her Majesty's ships; the store-room bulk-heads to be built open for ventilation, with round iron bars ⅝ in. diameter, and about 2 in. apart, as is done in the steamers of the British navy; to have all such fittings and framings as may be required for the engines, boilers, funnel, &c.; the bulk-head of engine-room to be of larch, Dantzic fir, or Prussian deals, 3 in. thick, rabbitted, fitted and lined with ⅞ in. oak board, with felt between from the top to the bottom, and made water-tight, with a coat bedded in felt at the bottom, to prevent the water in the engine-room running forward or aft, to create a stink; to have two Downton's pumps and pump pipes, the pump pipes, &c. to be found by owners, fitted to draw water from every part of the ship, for filling and emptying tanks, and also as a fire-extinguisher, at any part of hull, masts, or sails; to have four lead scuppers in each side, 4 in. diameter in the clear, to carry the water off the deck, and one metal hawse-pipe on each side abaft, to secure the ship abaft; to fit as many water closets as may be required, (Downton's patent ones), to be found by the owners; to have metal pintles and braces in the post and rudder; the back of the post to be hollow, to receive the rudder as a rule joint and metal flange on deck; to secure the rudder-head with paul hoop and pin, on Mr. Lang's plan, for pauling the rudder when required, and a wooden cant outside, bedded in felt, in lieu of a canvass rudder cant; to have all necessary pillars of wood and iron for supporting the decks. The engine-beams to be of English or African oak, sided and moulded, as shown on the section, dowelled to the timbers, and well bolted with copper bolts, 1 ⅛ in., in the wake of the engine, and 1¼ in. abaft, in wake of the boilers, with strong substantial copper washers on each, well clenched, more particularly in wake of engines. All the straight timbers of the frame may be larch or mahogany, except those in wake of paddle-wheels, and such of the top timbers abaft and before the paddle-boxes, may be Dantzic fir, as marked fir on the drawing. All the wood work usually painted to have three coats, and to complete all the plumber and glazier works. To have a figure-head full length, or bust, as may be directed, neatly carved; the stern to be ornamented with drops at the munions, a trophy in the middle of the taffrail, finished with some light running work, according to the design which may be furnished for the carved work. The quarter gallery munions to be carved with drops similar to those on stern. The floor, half-floor, and lower futtocks, which are dowelled and bolted together, composing part of a frame; bends to be crossed on a temporary keel, each between the stations U and 22, and ribboned, that their sides may be connected with, and dowelled to each other, to give strength to the ship; and when that is performed, the proper keel to be got under, and to be dowelled to the underside of the floor timbers; on this being done, the remainder of the frame timbers may be raised in their places. Rudder as shown in the drawing, to be sided from the upper bull to the keel, one inch less than the stern post on each side. To be copper sheathed, with 28 oz. copper, from the keel up to 2 feet above the load-water mark, that is to say, 17 feet high. The front of the knee of the head and gripe to be covered with thick brazier copper down to 10 feet under the fore-part of the keel, to prevent the cablefrom cutting the wood;

to fit two bumpkins for fore back, and all necessary iron davits for the boats; to fit a small sponsing of fir on the fore-side of the paddle-boxes, to defend the wheels from the sea, as is described in the drawing.

Caulking.—The ship's sides and decks to be well caulked with good oakum, to be picked out of good junk, and to be sound in all respects, and to be driven in every seam and butt of—

7 in.,	10	double threads	black oakum, and	2 in.	spun yarn.
6 „	8	„	„	2	„
5 „	6	„	„	2	„
4 „	5	„	„	2	„
3 „	4	„	„	1	„
2 „	2	„	„	only	

All the timbers in the frame to be young timber, and not grain cut out from large timber. If any materials or workmanship be deemed defective, unsound, improper, or insufficient by the officer or officers appointed to inspect the same, then in such case the said ———— is from time to time, and as often as the same shall happen, to cause all such defects and insufficiency to be forthwith amended and altered, as the case may require, to the satisfaction and good liking of said officer or officers. The methods for performing the different works not stated herein, will be shown in the drawings, as great care is to be taken in laying off the vessel, that the lines are strictly adhered to.

Time of Launching.—And the said———— do further promise, covenant, and agree to and with the said ————, that the said ship shall be completed, launched, and delivered safe afloat into the hands of such officer or officers as by———— for the time being, shall be appointed, by or before the ———. Rate per ton £ , in consideration whereof the said parties hereto do hereby for and in behalf of the ————, promise and agree that the said £ shall be paid for the said ship, after the rate of £ per ton, viz., for as many tons as the said ship shall measure, not exceeding 1285 14-94, but not for any greater number of tons; and such rate of tonnage is hereby declared and agreed to be the full and entire compensation and payment for the said ship, without any other charge, expense, or demand whatever. The heels of the cant timbers to be bolted across, through the dead wood, with a copper bolt of 1 in. clinched on a copper ring at each end.

Payments.—1. When there is sufficient timber in the yard to complete the vesssel in her floor, riboned, the sum of £ , to be certified by the officer.

2. When the vessel is complete in her frame, per certificate as before, £ .

3. When ship is planked without and within board, and all the beams of the upper decks in their places, £ certificate, as before.

4. When all the beams are in decks, laid and caulked top sides and bottom, and the ship launched and ready to receive her engines, £ .

5. A final payment when the vessel is complete, to be certified as before.

THE STEAM DREDGING MACHINE.

(From a Correspondent.)

I OBSERVE in a contemporary journal some remarks on this subject, elicited by a statement which has been put forth in a work called "Blunt's Civil Engineer and Machinist," to the effect that the late Mr. Rennie was the inventor of the steam dredging machine, he having first applied it at the Hull Docks. This statement is so grossly at variance with what I have always understood to be the fact, and betrays so complete an ignorance of the subject, and so great an inconsistency and contradiction on the part of the conductors of Blunt's Civil Engineer, that I shall be excused for bringing before your readers a few particulars, which may serve to clear up the mist in which certain parties, either from ignorance or design, have chosen to envelope this subject.

Before, however, making any remarks of my own, I cannot avoid referring to a specimen of the style of bookmaking which prevails at the present day in the shape of a Report in the former number of Blunt's Engineer, where the invention of the steam dredging machine is unreservedly claimed by the late John Hughes, who professed to have constructed the first engines for deepening the Thames at Blackwall and Woolwich moorings. Now, one thing is quite certain, —if the statement made by the present conductor of Blunt's Civil Engineer be correct, as to the invention of the engine by Mr. Rennie, and its first use at Hull Docks, then Mr. Hughes's Report must be a tissue of falsehood and absurdity, because it is half filled with an account of a contest, in which he was opposed to Mr. Rennie and other engineers as to the practicability of deepening the Thames at Woolwich moorings, by means of dredging. In this contest Mr. Rennie and his colleagues advocated the entire abandonment of Woolwich moorings, stating that it would cost £152,000 to reinstate them, and recommending the establishment of a naval dock yard at Northfleet, at a cost of seven millions sterling. Mr. Hughes, on the other hand, strong in reliance upon the capacity of his newly invented engine, heartily opposed the abandonment of Woolwich moorings, and offered, by means of dredging, to reinstate them in eighteen months. I need scarcely add, that the Lords of the Admiralty allowed him the trial he sought, nor need I dwell upon the complete success which attended his operations, both there and in every other situation where dredging by steam was employed. I would here ask, however, if Mr. Rennie had previously used the steam dredging machine at Hull, whether it is likely that he of all men in the world would have been ignorant of its powers? Would he not on the other hand have been the person most anxious to show how mighty an agent the engineer had acquired, what astonishing effects it was capable of achieving, and what benefits it was destined to bestow upon the navigation of this country? Undoubtedly Mr. Rennie would have appeared under a very different aspect had he been, what is now pretended, the inventor of the steam dredging engine. But what can I think of the consistency of an editor, who in one part of his work parades before his readers an ostentatious account of the invention by one individual, in which account be it observed every particular is detailed with so much accuracy as to leave no particle of merit to any other person; and who then, in a subsequent part, without any allusion to what had gone before, recklessly and heedlessly, in opposition to glaring incontrovertible facts staring him in the face in his own book, unhesitatingly gives all the credit to an entirely different person? The work, it should be observed, in which this precious piece of consistency is exhibited, is not a light trifling periodical, in which correspondents are allowed to talk as much trash as they please, and to write all the nonsense which comes into their head, but it is a standard work, which promised from its earlier parts to be of high and respectable character, and which professes to consist of treatises on civil engineering, engineer buildings, and many other subjects of equal importance, Nothing should be admitted into such a work but what is strictly true, nothing which cannot be entirely depended on, and far less should one part entirely

contradict another, so as to mislead and perplex the reader, till he is tempted to doubt the accuracy of that which really is entitled to belief. It is no apology to say that the first account was a report by some person for whose sentiments the conductor is not responsible. This report stands in that part of the work as the sole and single account of the invention of the dredging engine, and the conductor of the work ought to have inquired into its accuracy before allowing it a place in his work.

The whole case, however, becomes ten times worse if it shall appear—as I believe it will—that the first account is in reality the true one, and that the second, in which the credit is given to Mr. Rennie, is entirely at variance with fact and sense.

It is remarkable that the encyclopædias, which are usually expected to contain the best information on subjects of this nature, all concur in giving very unsatisfactory histories of the invention of the Dredging-engine. Thus the writer on the article Dredging, in the Encyclopædia Metropolitana, says,—"The bucket dredging-engine has been generally supposed of British origin; and it was certainly first used in England by the late Mr. Rennie, at Hull. It is probable that steam was not applied to the bucket dredging apparatus prior to the commencement of the present century, nor brought into general use sooner than ten or twelve years after that period." In Brewster's Edinburgh Encyclopædia I find the following:—"Improved dredging-machines on the principle of an endless chain have been undergoing such improvements as experience has pointed out; and it may not be deviating from our general plan to remark, that when these machines were first constructed, horses were employed as the moving power, and had a circle appropriated to them on board of the barge that carried the machinery; and it was usual to have the horses so taught that by the ringing of a bell they would immediately stop."

The Encyclopædia Britannica says,—"Though we have not been able to trace the invention of the bucket dredging-machine to any particular person, yet I believe it is strictly of British origin, and, so far as our information goes, was first used at the port of Hull, in the Humber."

Now, in neither of these accounts does any proper distinction appear to be drawn between the invention of the bucket machine and the application of steam to that machine. If the writers of these several accounts really intend to claim the common bucket dredging-machine, as worked by manual labour or horse power, as one of British invention, they are decidedly in error; as any one may readily satisfy himself by consulting the plates in Belidor's "Architecture hydraulique." In this work, which is a hundred years old, will be found complete drawings of the horse dredging-machine, long before any thing of the kind was used in this country. But, on the other hand, the application of steam to dredging purposes, and the construction of the first engine which actually dredged by steam power, may with perfect confidence be claimed for this country; and we need scarcely say, that this is the only question of any importance connected with the subject. It is this application of steam which has achieved such great works in dredging,—it was this which gave so much labour to the inventor, and entailed upon him so much expense and difficulty, that, considering the national benefits he has conferred, few men appear more entitled to reward or consideration on the part of Government. Having carefully perused the statements put forth in Blunt's Civil Engineer, and several other publications, on the subject of the application of steam power by the late Mr. John Hughes, while executing several contracts for Government, for the West India Dock Company, and other bodies, I feel no hesitation in declaring my firm conviction, that the sole credit of this most important work is due to him. In corroboration of this opinion, I quote the following paragraphs from the Report by himself which has been alluded to, and which, if incorrect, would speedily meet with contradiction from many persons now living, who are fully aware of the circumstances of the case:—

"It must be a matter with which you cannot be unacquainted, that when the immense docks at Blackwall were formed for the East India Company, it was also necessary to deepen and excavate the bed of the river Thames at the moorings opposite the dock gates; with this view, the Honourable the Corporation of the Trinity House, being at that remote period of time the only body of men who would attempt to engage in such an arduous undertaking, were employed for nearly two years at the expense of the Port of London Committee in that operation, but at the end of that period they abandoned their pursuit as being impracticable, after incurring an expense of from £60,000 to £80,000, because their ballast spoons or other materials were not sufficiently strong, or properly constructed, to penetrate the *strata*, which, at this part of the river, consists of strong blue clunchy clay, intermixed with layers of rock, called Parker's or Roman cement stone.

"Understanding that these strata were impenetrable to all the ballast machines of that day, and that the Corporation of the Trinity House had, at the suggestion of the House of Commons, advertised for *engineers and others* to furnish plans for raising ballast upon an *improved principle*, knowing also that the well-known Mr. Ridler, of Millbank, the mail coach contractor, had failed in accomplishing his great national object, and abandoned his scheme, after losing upwards of £8,000 by it; and it being also known, that Mr. Davis Geddy, M.P., had recommended no less a personage than the great and well-known Richard Trevithick, Esq., of Cornwall, civil engineer, to the notice of the Honourable the Corporation of the Trinity House, as a man possessed of skill and abilities equal to any operation that was capable of being devised; knowing that he had also completely failed in this undertaking, I, immediately, in the absence of my well-known and respectable partner, William Bough, Esq., then attending a large contract at the Dartmoor prison, wrote, and suggested to him a *mode or principle of a floating steam-engine*, which, I thought, would fully answer the intended purpose: to this he readily agreed, and having already the steam-engine in hand so much noticed for dragging or hauling upwards of 2000 tons of gravel daily, upon an inclined plane 40ft. in height, on my contract at the West India Docks, I immediately set about preparing it, which I was able to do in about three months; and as soon as it was ready I proposed to the Port of London Committee to deepen and finish the East India moorings; consequently it was advertised to be let, and I became the successful candidate, and engaged in the contract. The port committee came down to see the operation of the engine, and were exceedingly sanguine about the success of this (at that time) novel and singular contrivance. Several trials were made in their presence, and I had the mortification of seeing various parts of the engine which had cost me great expense, and intense thought, torn to atoms, and links of chain 1½ in. square broken and snapped off, just as easy as the stalks of so many tobacco pipes, by the expansive power of the steam, and finally the machine was almost torn to pieces and rendered useless,—a great disappointment to me as well as to the port committee. Having, however, been finally bound to do the work, it was of no use to reflect on this day's trial; which, however, gave me an opportunity of seeing that the engine had sufficient power to penetrate the strata, but at the same time many improvements were still wanting to make the machine equal to its task. It was, therefore, laid up in Mr. Perry's dock, at Blackwall, and in the course of a few weeks I had many additional friction blocks fixed to prevent breakage, and several other improvements made, which, on the next trial, proved successful to the highest degree of perfection, and I effectually accomplished my contract, to the entire satisfaction of my employers."

S.

THE MODERN PRACTICE OF GOTHIC CHURCH ARCHITECTURE.

A GREAT effort has been made in our day to re-establish in this country the practice of Gothic architecture. The necessity of increasing the number of churches for public worship, gave the first impetus to the revival of the study of this beautiful style of architecture, and directed the attention of artists and ecclesiastics to a more

careful observation of the best specimens of the middle ages. Public interest has thus been drawn to the subject, and tempting premiums have been offered to the ingenious and successful student. It is true that these have not always been obtained by the most deserving, as many of the modern churches testify, unless I admit, which I am quite unwilling to do, that the art of design has fallen into a despicable meanness of invention, that is to say, unless I pass a sweeping censure upon the British architects of the present age. But whatever estimate may be formed by a future generation of the state of learning, science, and society in the early part of the nineteenth century, it will never, so long as a vestige of our work remains, or a record of it, be for a moment supposed that there was a dearth of mind or of means to carry out an object sincerely sought, or in any degree required, by the condition of the community at large, or by any particular class. But as there has been a great demand for designs in Gothic architecture, and as many buildings in that style have been erected, it may be well to inquire whether they support the character which it is hoped a future generation will give us, from the examination of our general history, and the intrepid and successful efforts we have made, not only to meet the wants of society, but to stimulate it to new exertions.

That the knowledge of a style of decorative building, essentially ecclesiastical, and in many of its principal features English, has not been sought in vain, the numerous excellent works which have recently been published to explain and illustrate it, sufficiently prove. A style which a few years since was denounced as a barbarism, which a man could not speak of in polite society with an epithet of approval, much less of praise, is now publicly pronounced, by all men of learning and taste, as possessing the purest elements of a sublime invention. These books have been read, and curiosity has been excited; the churches of the middle ages have been examined, and the judgment has been convinced of their excellence. It has been proved to all the world, during the last few years, that the monks of the twelfth and thirteenth centuries were men of great taste and skill, and developed a style of architecture peculiarly suited for the public services of the religion they professed; and now, to be deficient in phrases to express a real or imaginary delight in viewing any of their venerable structures, would consign a man to a clanship far less enviable than that in which the monks themselves were placed, when the centuries to which they belonged were called the dark ages. But the terms of art are now household words, and ladies with a boarding school education, are expected to talk of buttresses and mullions, labels, spandrils and groining. The revolution in public opinion as to the character of the architecture of the middle ages, exhibiting itself in this and a thousand other ways, has been produced by the publications resulting from the investigations of modern architects. Who, then, can for a moment suppose that there is in the profession any want of knowledge upon the subject, or a capability to practise it? who can suppose that a man who has availed himself of the accumulated experience of the nearly three hundred years which have elapsed since Gothic was the only style of ecclesiastical architecture, and has professionally examined the best specimens erected in the thirteenth and fourteenth centuries, could not now produce a building equally worthy of praise?

I must, therefore, assume, and upon evidence not to be rejected, that there are men in the present day who are critically acquainted with ecclesiastical architecture,—who could design in a style not inferior to the best examples of the ancient masters of the art; men who are master masons, and who, had they lived in the time of Otho the Goldsmith, or of William of Wyckham, would have been enrolled with honour in their several guilds, and found competence and fame, the admiration of the age, the favour of princes. But what evidence is given upon this plea by the modern churches? Unquestionably they give, with a few noble exceptions, a positive denial. From an examination of modern churches, without reference to other evidences, no unprejudiced judge could assert that the present age has an acquaintance with the ecclesiastical style, for the few which would bear a favourable, and by themselves a conclusive testimony, would be overwhelmed by the evidence of the multitudes whose cross-examination would totally prejudice the cause upon which they were retained. In fact, the greater number of modern Gothic churches, or rather churches in which the Norman or pointed arch is introduced, are the worthless and despicable productions of boys or men, who aspire to greatness by reducing the elements of beauty or simplicity in a cathedral, into the dimensions of a small parochial church; whose self-approbation or accumulativeness so completely control all the faculties of their deformed minds, that they are unable to perceive their own littleness, while they compare their misshaped offspring with the beautiful and graceful creations of minds they could not measure in a century of observation. Painful as it is for one who loves his country and his art to pass such a censure upon his cotemporaries, what truth requires, honesty cannot refuse to assert. Among all the Gothic churches erected by the present race of architects, there are very few which can bear a comparison with the inferior specimens of the middle ages, and the others are too mean to even admit of criticism. The exercise of an indiscriminating, and frequently unfair patronage, has been the main cause of this blemish upon the Architectural reputation of the age. But I must not be misunderstood. I do not say that friendship should have no influence upon the heart; that sentiments of kindness or regard are to be smothered; for I would rather that the country should be studded with ugly, unmeaning, and barn-like churches, than that the English warmth of friendship and feeling should be stunted in its growth. But an Englishman says, that justice should be esteemed before generosity. If a man, from local circumstances, or from having the power and will to give largely, possesses great influence over the opinions and determination of others, and has resolved that some friend or favourite shall be chosen as the architect, let him act like an honest man, and request or insist upon his being employed. The chances are then, that a suitable design at least may be obtained, even if the individual chosen be incapable of executing the work in the genuine spirit of an artist of the middle ages. But this is not the course usually adopted. The entire profession is solicited to offer designs for the proposed work, under certain conditions, and in many instances a hundred individuals have sent drawings. The men who have been most conscientious, and have performed the conditions literally; who have carefully estimated the costs of their designs, and have produced drawings and specifications which might have been immediately acted upon, without a loss of character or honour to themselves, have been met by those who were unscrupulous, and who, by artistical effect, and indifference to the conditions stated, have produced drawings which immediately attracted attention, and secured a favourable reception. Three or four of these have been chosen, and then interest has added its weight to the scale. Those who can thus descend to cheat and juggle a committee of men utterly incapable of judging the merits of an architectural composition, upon the conditions they have themselves imposed, cannot be scrupulous in using means to secure patronage and interest which a noble mind would disdain. The man, the dishonest man, who has secured the greatest number of friends, does, therefore, in the greatest number of instances, secure the prize in competitions.

Trace the effect of this system of patronage a little farther: the drawings are returned to the successful competitor, but he is also permitted to have a view of those with which his own has been brought into competition, for what objection can there be in exhibiting the inferior to him who has produced the superior. These, however, he uses as he may find occasion—to cover one sin he unhesitatingly commits another—dishonest in part, he becomes dishonest in the whole. Laden with the rich stores he has stolen from other hives, he gains from one week's examination of what others have done more than by his own unaided powers he could have produced in a life, and he is better qualified for the roguish practices he has chosen, than if he had, unassisted, studied the art of deception for the term of an apprenticeship. Conscious that his designs cannot be executed for the amount to be expended, he is now anxious to cover his trick as much as possible. Upon the external design little reduction can be made, but still he may make some. In the construction, a considerable diminution in the amount of the estimates may be effected, partly by the adoption of inferior workmanship or materials, and partly by omissions to be introduced as extras. By an union of tricks, and hoping for a low estimate in consequence of the strong competition of certain builders, who usually oppose each other, or by making proposals to some favourite contractor, he succeeds in obtaining an offer not much above his own estimate. The work is commenced, and at last is completed, with a bill of extras which nearly doubles the original estimate. Or if a less favourable tender be offered, a new design is produced, and the opposing competitors are openly and unblushingly robbed of their time, money, and honour, and the parties to this robbery are men who preach honesty in their pulpits or counting-houses, men who would follow a thief or a delinquent to the very extremities of the law.

I ask every man who has engaged in competitions, successful or unsuccessful, whether I have overstated the case. There is no man at all acquainted with the working of the profession during the last fifteen years who could not conscientiously affix his signature to every assertion that I have here made. Who then can wonder that the large majority of modern churches are unworthy specimens of modern art, and reflect disgrace upon the architectural skill of the age.

But I shall perhaps be told that many of the modern churches have been erected from designs not chosen in competition. This I admit, and from that class select almost all those which I have excepted from strong censure. No evidence can be more conclusive against the system of competition. It was adopted by the public upon the recommendation of the profession, and the profession justly bears the consequence. But the juggle has had its day; it is already classed with the things that were, and if the public does not know it is its own fault, that no respectable architect, whether poor or rich, will ever again present himself at a competition, any more than a merchant who values his character will be seen at a public gambling table. I do not know a single instance of honest competition, not one in which the successful competitor did not obtain the object of his ambition by interest altogether independent of merit; nor do I believe that any man can convict me of error. But upon this subject I challenge the profession, and if the gauntlet thus thrown down be not taken up, I must denounce him who at any future time enters a competition as either a fool, or a man careless of the means by which he secures his object.

From these remarks it will be perceived that I attribute the great want of taste in modern church building (and the remark applies in a greater or less degree to all public edifices erected under the same conditions) to the system of competition which has so long blighted the efforts and energies of the conscientious architect.

In plan the modern churches are not, perhaps, very objectionable, speaking of them generally, except that the chancels are not sufficiently large, and, as compared with those of the old churches, seem destined for the performance of rites of a less solemn and important character. Upon this subject, however, I will not make any further remarks at the present time, as I may perhaps be allowed another opportunity of expressing my opinions.

Before I conclude my present communication, I must be permitted to observe, that, considering the external elevations of modern Gothic churches, they are for the most part chiefly to be censured for their sameness in detail: they want energy, breadth, decision. A young painter, or one who is wanting in genius, endeavours to obtain an effect by highly working his pictures, and touches them as lightly and as fearfully as though every line must be geometrically true, and every tint in mathematical proportion. The master has a broader hand, and fearlessly throws in the lights, and darkens the shadows, depending upon the boldness of his touches for the effect he wishes to produce. The modern Gothic churches have an effect upon my mind similar to that produced by an over-wrought picture. In all their details they are too refined,—they seem to be the doubtful efforts of men who have been fearful of producing a heavy appearance instead of boldness, and who reduced the size and projection of the parts to obtain lightness, but at last only produced littleness. They are in fact the works of men who have not the confidence of superior knowledge and observation. To this subject, however, I shall again, with permission, direct the attention of the profession at another time.

B.

THE NAVIGATION OF THE COLNE.

Our attention has been long drawn to the important question, What must be done to improve the navigation of the Colne? and the time has now come for its being fairly brought before the public.

The river Colne, which is the port of Colchester, was in ancient times navigable for sea-going vessels up to the town, a distance of about eight miles, and, till the year 1623, in the reign of James I., there is no account of any obstructions to the navigation, nor of any attempt to improve its course, or deepen the channel. But at that period, it was described as being "so filled, choked, and stopped up, between the Hythe Mill (Bridge) and Rowhedge, that ships could not come up to their accustomed landing-places at the Hythe," and in consequence, an act of parliament was obtained in the same year for its improvement. Five other acts were subsequently obtained for the same purpose, the last being in the reign of George III., and dated May 6th, 1811. Under this act, the present commissioners derive their power, which extends also to the paving, lighting, cleansing, watching, and improving the town of Colchester. The commissioners thus appointed, are the members of the corporation, the magistrates for the county residing with the liberty, sixty-six other persons, inhabitants of the town, the owners of property on both sides the channel, and all other qualified persons being inhabitants, that is, possessing a personal estate to the amount of £1000, or hereditaments of the clear value of £50 a year. For the several purposes of the act, power is given not only to levy a tonnage rate upon all vessels using the channel above Wivenhoe, but also upon those who, although not using the channel, have any portion of their cargo brought into the liberty of the borough. The present

annual revenue from tonnage, is about £2000, but from the defective state of the navigation, a larger amount is expended in lighterage and other attendant charges. It may also be worthy of remark, that all vessels are compelled, under a penalty, to take their ballast from the commissioners.

It may easily be imagined, that with so large a number of commissioners, there must be various opposing opinions, and, in fact, that the business cannot be so well done as if it were intrusted to a less number of persons. Out of nearly two hundred commissioners, there are not perhaps more than twelve or twenty who are interested in the channel. The consequence of this has been, that the channel has been neglected, and large sums of money have been expended in altering and improving the town, so much so, that at one period the funds chiefly arising from the channel itself, were applied to a reduction of the usual town rates for paving and lighting. In consequence of this, legal proceedings were taken against the body of commissioners, and the improper expenditure of the revenue was prevented for the future. A considerable sum is still, we believe, devoted to objects unconnected with the improvement of the navigation, but the channel revenue is for the most part applied to its legitimate purpose, with what judgment and advantage will be hereafter seen.

The first apparently serious attempt on the part of the commissioners to ascertain what could be done for the improvement of the port of Colchester, was, in the year 1829, just eighteen years after the passing of the act, when they engaged Mr. George Bayley, C.E., of Ipswich, to make a survey of the river, and report on the works to be done for the improvement of the navigation of the Colne. The following was his first Report delivered to a special committee, dated 13th August, 1829 :—

GENTLEMEN,—Agreeable to the requisitions of the commissioners, I have, in conjunction with yourselves, inspected the channel from the lock to Rowhedge. There are several points (about 6,) which it is highly desirable should be cut away. The lock at the Hythe, in its present state, prevents any advantage being derived from deepening the channel, as the sills now lie considerably higher than the bed of the river. I would recommend that a new brick or stone lock be erected near to a part of the river called New Quay, instead of continuing to sink money in perpetuating the old wood lock, which is very much out of repair.

Such an erection, and the necessary cutting, would, I am quite convinced, be within the means of the commissioners to accomplish, but until I am furnished with a correct plan of the river, and have the opportunity of making the required measurements, I shall not venture to state any specific sum as the probable cost of the proposed improvements.

I beg, therefore, that the committee will give directions, that I may be furnished with a correct plan of the channel, upon which I may mark out the proposed improvements, and lay it, together with my report, before you at your next meeting.

I am, Gentlemen, &c.

At a meeting of commissioners, held on the 5th of October, 1829, the committee appointed for improving the channel produced Mr. Bayley's report, which was as follows :—

St. Peter's, Ipswich, 22*nd Sept.*, 1829.

GENTLEMEN,—Having completed my examination of the channel, and the adjacent lands, I beg to lay before you the following report :—

1. *The state of the lock.* The east side of the lock has partially given way, and the planking generally appears in a bad state. The upper gates are good, but do not shut close upon their sills. There are no lower gates, so that in its present state it is impossible to pass vessels up or down, except at high water. The sills of the lock lie so high, that there is but ten feet six inches water upon them at spring tides, upon an average, and at neap tides not more than six or seven feet. To put the lock into thorough repair, would require a large sum of money. To render the further deepening of the channel of service, the floor and sill of the lock must be lowered, which would be attended with as much expense as the erecting a new lock, besides the stoppage it would occasion in the navigation up to the quays for several months.

2. *The state of the channel*, will be best seen by a reference to the new and correct plan of the channel, which Mr. Gilbert has taken by order of the commissioners. On examination, it will be seen that the channel has a very winding course, which, by diverting the current against the walls, or banks, not only does great injury to them, and occasions a continual expense in repairing the walls, and removing the shoals formed by the irregular action of the current, but checks the course of the tide, and causes the channel to gain on the banks in some parts, and recede from others, thus rendering it still more crooked and inconvenient for navigation.

It will be observed, that the river gradually deepens from just below the lock to Rowhedge, and that vessels drawing near twelve feet of water can come up to New Quay, but are unable to pass the lock, there being one foot six inches less water upon the sill of the lock, than at New Quay. From the foregoing remarks, it is evident—

1. That if the lock be repaired, and kept in its present form, no advantage can be obtained for vessels going to the Hythe by deepening the river below the lock.

2. That to alter the present lock, so as to afford a greater depth of water, would be nearly, if not quite as expensive as a new lock.

3. That the winding course of the channel tends to perpetuate and increase this inconvenience, and to form shoals in various parts.

After carefully sounding and examining the river from the lock to Rowhedge, and taking all the circumstances of the case into consideration, together with the means at the disposal of the commissioners, I would recommend the following alterations to be made. 1. To entirely remove the present lock, and erect a new one in a piece of ground just below the new quay, if it be considered desirable to have a lock.

2. To remove the points marked on the plan A B C D E.

3. To make a new cut from just above Wivenhoe Wood through the Saltings, to come into the present channel at Glebe Sluice, or, if the funds of the commissioners would allow it, across the marsh belonging to N. Corsellis, Esq., in the direction shown on the plan from the oak tree to the present channel to Rowhedge.

Advantages to be expected from the adoption of the above proposition. The sills of the lock might then be laid sufficiently low to allow vessels drawing twelve feet six inches, or more, to pass at spring tides.

Removing the points, and making the two cuts shown in the plan, would render the course of the channel more direct, and cause the flood and ebb to run with a stronger current, so that vessels would ascend and descend with greater facility than they are now able to do. The current would then be more in the centre of the channel, and do less injury to the banks than at present, nor would shoals be so liable to form, the removal of which from time to time is attended with considerable expense. Having the lock in the piece of ground below New Quay would, by enabling the lock master to retain a larger quantity of water, furnish a powerful means of scouring the channel below the lock, by occasionally letting it off at or near low water.

The advantage which would result from making either of the cuts opposite Wivenhoe Wood, are too obvious to require remark.

When the course of the channel is rendered more direct, there is good reason to believe that the tide would ebb out, so as to leave the channel nearly dry, which would render the future deepening the river much less expensive than at present. Should it not be thought advisable to have a dock at New Quay, it would still be of great advantage to make the cut proposed, as the present channel has a sudden bend at that part, which checks the force of the tide, and is, besides, very inconvenient to vessels passing up and down the river.

Order in which the plans should be carried into effect:—

1. Erect a new lock, and when completed entirely remove the old one.
2. Make the cut opposite Wivenhoe Wood.
3. Remove the points, beginning with the lower one.
4. Deepen the channel, beginning at the lower part, which will cause the water to leave the part above nearly dry. Just below the present lock there is a sluice, which discharges the soil water from the mill at the distillery. The lower part of the brick drain for the soil water, is about level with the nine feet water mark at the present lock, and as the water may not be kept above the 8 feet 6 inch mark on account of East-mill, it would allow a six-inch fall from the mill-drain to the river, which would prevent any injury being sustained by the mill at the distillery. The sluice over the east side near New Quay, which discharges water from the lands belonging to the Baroness Lucas, would discharge the water below the proposed new lock. It would be desirable, that as much of the work as possible should be done by contract, and that the excavators should be paid by measurement, for the soil actually removed. The above works might be completed, and the river generally deepened in the course of seven years, so as to allow vessels drawing two feet more water than at present to get up the Hythe without difficulty.

The expense of carrying the above into effect would be:—

For the lock and cut at New Quay about	£4100
For the cut at Wivenhoe Wood, and removing points ..	3300
Deepening the river	2100
Total	£9500

The cut across the marsh, opposite the wood, would cost £1094 in addition to the above sum, exclusive of the purchase of the land; against the expense of purchasing the land is to be put, the value, whatever it may be, of the land reclaimed; it is considered that the present lock gates should be made use of for the new lock.

(*Signed*) GEORGE BAYLEY.

This Report was presented to the commissioners, with the recommendation, "that so much of the plan as related to forming a new lock and cut through the meadow below New Quay be carried into effect, together with deepening the channel from the Hythe Bridge to the bridges or hardways." The recommendation of the committee was adopted by the commissioners, and a committee was chosen to carry it into effect.

The commissioners having resolved to carry into effect the recommendations of Mr. Bayley, it might have been expected that some effort would have been made to improve the navigation, but to the present time nothing has been done, beyond the removal of some mud points, which of course appear again almost as soon as they are destroyed.

In the year 1840 Mr. Tabor, a resident in Colchester, but not a professional engineer, published a pamphlet "On the Improvement of the Colne Navigation, more especially from Colchester to Wivenhoe," in which he proposed to lock up the channel, and keep the water line to spring tide level. This he proposed to do by damming the river at Rowhedge, cutting a new channel across the marshes at Wivenhoe, and placing at its entrance a ship lock. The objections to this bold and highly creditable proposal were, the strong floods which occasionally occur over the district; the mill streams and drainage of a large tract of country which empty themselves into the channel when the tide is out; and lastly, the expense of deepening and maintaining the channel from Wivenhoe to the Hythe. It has hitherto been considered by persons resident in Colchester, and by those most interested in the subject, that these objections are fatal to the proposition, and it has consequently occupied but little public attention.

In 1840, Mr. George Edwards, an engineer residing at Lowestoff, was requested "to inspect the river with a view to its improvement, and to report his opinion thereon," and on the 2nd of October he presented his first Report to a "committee appointed to consider the most effectual method of improving the navigation of the port of Colchester." Mr. Edwards recommended several plans to the commissioners which were similar in character to that proposed by Mr. Bayley, and differ chiefly in the extent and position of the cuttings. We may, however, give his opinion in his own words.

"The improvements which I am about to suggest to the consideration of the Commissioners, are adapted to the admission of vessels of 14 ft. draught of water to the commencement of the Hythe, during the spring tides, and of vessels of 10 ft. of water during the neaps. I propose further to keep them constantly afloat, and to prevent in future any accumulation of warp at the Hythe.

I propose to deepen the river to its required depth by dredging the bottom of the channel by means of a steam dredging machine, to cut off the worst of the points, and to prevent them from growing up again (as has occurred in the Wood Reach), by depositing the soil removed from them in the corresponding hollows, which proceeding will further straighten the channel.

In the upper part of the river, from Stake Reach upwards, where there is not width between the banks to make an efficient channel, I propose to set back the banks in places on either side so as to straighten, whilst widening the channel, and to such an extent as to give a width of 100 feet at the water level of neap tides.

This method has the advantage over another proposed, namely, making a new cut, in point of diminished expense, and in not interfering with the adjacent property, the drainage and other existing rights. Besides which, if a new cut was made, the old and wider channel of the river would speedily silt up, and thus be lost as a backwater to the river below.

I propose to maintain the depths thus made, and entirely to prevent any further accumulation of mud at the Hythe, by constructing a new quay, and by constantly maintaining the water above it above the level of spring tides. As this cannot be done without interfering with the tail water of East-mill, I propose to make an arrangement with the proprietor of the mill to give up two or three feet of the fall or head of what will thus become the floating basin at the Hythe, which being thus constantly maintained without the admission of tidal water, no warp can by possibility enter: such arrangement with a little improvement of the course of the river would also enable lighters at all times to navigate upwards as far as East-mill, and thus employment would still be found for this description of craft, which are not likely to be wanted for their present purposes when the navigation shall have been improved.

If, unfortunately for the interest of the navigation, it should not be found possible to make an equitable arrangement with the mill proprietor, I propose to make a dam at the new Hythe bridge, and to turn the tail water through a new drain to be made for that purpose, into the river below the new lock, which would in its course also receive the water from the Crockelford and other streams.

It will also be necessary to turn the water from the distillery mill drain, to below the new lock.

The wharf walls along the Hythe are in so bad a state, and on such slight foundations, that I do not think it would be possible to deepen the channel effectually, until permanent quay walls are built throughout on both sides. As this would, however, be a heavy expense, and the benefits, perhaps, greater to individuals than to the public, I would recommend at first only making such a depth as would not injure the present wharf walls, and whenever these should be rebuilt by their proprietors, to dredge accordingly.

To afford accommodation to the public, and to a larger class of shipping than can at present use the port, I propose to form a public quay between the lower granary and the present lock, about 600 feet in length, where six vessels, of 200 to 300 tons, might lie alongside, or if berthed end on, as at Yarmouth, as many as eighteen, the river being sufficiently widened at this part for that purpose.

I estimate that the above works may be constructed, the lock being 30 feet wide, for the sum of £30,000. If a lock 45 feet wide, which would only be necessary for steamers, £34,000. In the above estimate I do not include the purchase of the land, cost of act, &c."

In this plan, and the remark equally applies to Mr. Bayley's Report, sufficient attention is not given to provide for shipping at the Hythe. At present there is not room for a small vessel to swing. The wharfs also are of the very worst description, and are constructed with planking supported by struts from mud sills fixed in the channel, and are generally in a most dilapidated state. The propriety of building a lock at all, the commissioners being unable by the provisions of their act to lock up the water more than eight feet above the present lock sills, seems to us very doubtful, even although the depth might be increased another foot or eighteen inches. To go further with the deepening, so as to give even ten feet at neap tides, would, from the evidence before us, involve the reconstruction of all the present wharfs, as well as the setting back of the banks to obtain a sufficient bottom width. How far the channel below the lock might be affected by the stoppage of the usual flow and ebb of tide above it, is also a matter of some consideration.

In August, 1842, Mr. Bruff, civil engineer, made a report to the commissioners, in which he proposed to construct a ship canal from Wivenhoe to Colchester, and to form a floating basin and dock. What reception this suggestion has met with from the commissioners we do not know, but we are convinced that it is worthy of their most serious attention, and it will be well if, when they have formed their resolution, they act with a little more decision and energy than has hitherto characterized their proceedings. A want of space prevents us from describing and commenting upon Mr. Bruff's plans as con-

ained in his Report and Supplement, in our present number, but we shall resume the subject, and merely state at the present time that they are worth their additional cost as compared with other proposals. But, in conclusion, let us recommend any future committee not to consider, like their predecessors in 1841, "the difficulty of reconciling conflicting interests, and giving general satisfaction to parties who would be most affected by extensive changes." These have been the causes of long delay in attempting the object for which they were invested with office, and if that object be much longer opposed by private interests, they will find the power which has lain so idle in their hands will be delegated to a smaller and a more active board.

(*To be continued.*)

ART-UNIONS.

The success of the London Art-Union, and the want of that punctuality which is so important an element in every well-constituted society, have together produced many rivals, who will probably greatly diminish its funds, and without care produce the disunion and destruction of the Institution. Success in any new enterprise is sure to invoke a multitude of competitors, who, improving upon the original plans, and gaining experience without the cost, have a fair chance of superseding the institution which called them into existence. But when that enterprize has been supported, in spite of many annoying and vexatious disappointments, and when the confidence of the public has been shaken, the chance of success to the rivals is greatly increased. How far these remarks apply to the Art Union we leave the directors and the public to judge; but we have no doubt that its competitors will have in many respects a most beneficial effect upon the institution, and by exciting the officers and artists to activity, enable it to regain public confidence, and induce a continuance of the support it has received. We may perhaps be permitted to recommend the managers to take into their serious consideration the propriety of presenting their engraving at the time of subscription, and if this cannot be done during the current year, arrangement may be made for the future.

We have before us the particulars of two other metropolitan institutions of the same kind, both of which make large promises to their subscribers: The National Art-Union, and The Royal Polytechnic Union of London, of which we shall take further notice when we have had an opportunity of ascertaining the amount of confidence they deserve, and the character of the publications they offer to their subscribers. Other institutions of the same kind are also, we believe, likely to be formed during the present season.

The Polytechnic Union intends to present its subscribers at the time of payment, with "thirteen finished etchings on ten steel-plates, printed on India paper, in an ornamented cover; illustrating a selection from the songs of Shakespeare. It is determined that the following class of works form the prizes, viz., paintings, drawings, engravings, sculpture, and bronzes; and, if on improved principles, mathematical, astronomical, and all kinds of philosophical apparatus, working and other models made to scale, and musical instruments; such being not only the productions of artists and men of science, but also the property of the producers." The drawing is to take place at a general meeting of the subscribers on the 25th of April, 1843.

The National Art-Union is not a society, but a speculation, and some of the most eminent print-sellers are the "managers." The subscribers are to receive an engraving at the time of payment, and are allowed a choice from different subjects. We cannot discover any reason why a company should not be formed to speculate in this way as well as in any other, if by respectability public confidence can be secured, though we have an objection to some of the arrangements of the National Art-Union. But as it is our intention to examine, in a future number, the claims of these societies and speculations in general, it is not necessary to urge them at the present time.

REMARKS UPON THE REPRESENTATION OF THE HUMAN COUNTENANCE IN SCULPTURE AND DRAWING.

BY AN ARTIST.

He who has not compared the natural with the antique head, or learned the characteristic differences, or studied the principle on which the ancient artists composed their works, may be betrayed into the grossest misconceptions by too implicitly following their models. In painting a Hero, for example, to whom an ancient would have given a strongly marked character, with bold anatomy, and powerful expression, he may follow the ideal form of a Deity, in which the Grecian had studiously divested his model of all that could indicate natural character, or might seem to pertain to humanity. The ancient artist, in following the mythology of his country, and the description of her poets, studied to embody his idea of the divine character, and give repose to the limbs, without any indication of muscles or veins, and delineated a face full of the mild serenity of a being superior to the passions of mankind, as shadowing a state of existence, in which the will possesses the most perfect freedom and activity, without the exertion of the bodily frame. But those ideal forms are scarcely ever to be transferred to the representation of the human body; and the artist who indiscriminately follows such a model, misapplies the noblest lessons of his art. In natural action, there is always a consent and symmetry in every part. When a man clenches his fist in a passion, the other arm does not lie in elegant relaxation. When the face is stern and vindictive, there is energy in the whole frame. When a man rises from his seat in impassioned gesture, there is a certain tension and straining in every limb.

In the infant's skull, the cranium is of great magnitude, compared with the face; the head is oval and elongated,—the forehead is flat,—the bones of the nose are small,—the jaw bones are small and flat,—there is little depth in the jaw,—and the neck is small, compared with the size of the head, which is owing to the peculiar projection of the back part of the skull.

Again, we observe that in the progress from infancy to youth, the upper jaw bone is greatly enlarged, for there is then formed in it a great cavity, called the maxillary sinus. By this enlargement of the upper jaw bone, which is the centre of the bones of the face, a new character is given to the whole countenance. The bones of the nose are raised, and the nose is lengthened; the cheek bone also is made to project. But further, the growth of the teeth deepens both the upper and under jaw bones; and one necessary effect of this is, to make the angle of the jaw bone under the ear, recede more towards the back of the head. To make room for a full set of teeth, the jaws are also elongated. By the growth of the teeth, and of those processes of the jaw bone which are necessary to support and fix them, the face is deepened and made longer, so as to differ from the chubby face of a child, and by the lengthening of the jaw, and particularly the receding of the angle of the lower jaw, a manly squareness is

given to the chin. In the older skull, the face is increased in its proportion to the whole head; but the brow is not increased in the same proportion, though its form is so far changed, that there is a fulness and prominence towards the ridge of the eye-brows. The cause of this is, the development of the frontal sinus, the projection over the eyes peculiar to manhood. In attending to the forms of the lower jaw bones, we may observe several peculiarities distinguishing the face in different ages.

Compare, for example, the length, depth, and particularly the angle of the jaws of childhood, manhood, and old age. The cause of the smallness and roundness of a child's face is apparent from the little projections of the point of the jaw at the chin, and from obtuseness of the angle behind. In the adult, we observe a greater depth in the body of the jaw bone, and the teeth being added, the base of the jaws must be necessarily more separated, and of course lengthened. We see further, that as the teeth shoot up behind, the jaw must be lengthened to accommodate them, and the chin therefore projects, while the angle of the jaw recedes backward. Lastly, when the teeth fall out in old age, the processes which grew up with them, and supported them, waste away, and there remains nothing but the narrow base of the jaw, while the length of the bone, from the hinge of the jaw to the angle, is undiminished. The jaws are allowed to approach nearer to each other at the fore-part; the angle comes more forward, and resembles that of a child, but the chin projects also; the teeth and adventitious part of the jaws being gone, the chin and nose approach, and the mouth is too small for the tongue; the lips fall in, and the speech is inarticulate.

The next observation which is naturally suggested on the subject of character, as it relates to youth or age, is the distinguishing and necessary form of the child's head. We observe, that the length of the skull is from the forehead to the back of the head. This great length, compared with its depth, no doubt diminishes as the child advances in years, but still the largeness of the head, the projection of the back of the head, and flatness of the forehead, must be attended to.

We may finally perceive, that the peculiar character of the face in manhood results from the increase of the number of teeth, the depth of the jaws, and the formation of the cells in the upper jaw bone and frontal bones, and particularly the former of these cells; for, by the enlarging of the upper jaw bone, the nose is elevated and arched, and the cheek bones are thrown further out.

If we make a sketch of a head, with the shoulders elevated, the head thrown back, the line of the face inclining very much backward, and the jaws prominent, the lips thick, the nose flat, and the space betwixt the nose and mouth large, we shall have the unequivocal character of the negro head.

To give a head the air of the antique, the reverse of these proportions must be observed; the facial line being brought to a perpendicular, the eyes are thrown backward, and the space from the eye to the outer line of the eye and forehead deepened. Accordingly, the most striking peculiarity of the antique head, is the deepness of the eye, and the perpendicular line of the forehead and nose. We cannot fail to observe, that the deepness of the eye, in the ideal head, has not the same effect which it would have in the natural physiognomy: the reason is, that, in relation to the face in general, and the cheek bone, the eye is not sunk, but only in relation to the greater elevation given to the frontal and nasal bones. The peculiar roundness of the chin and lower part of the face, is the effect of the shortening of the jaw, which is made more remarkable, by adding in fleshiness to those muscles which move the lips, are the organs of speech, and serve to express the passions. The fleshiness of the lips and chin is remarkable in the Grecian heads. We observe a great breadth in the forehead of the antique, more than is natural to the skull: the orbits are large, and the angles formed by the cheek bones of the common skull would be cut off, were we to apply the oval of the antique face to the naked bones: the angles of the jaw would likewise be cut off.

To brutify a human countenance, we have only to diminish the forehead, bring the eyes nearer, lengthen the jaws, shorten the nose, and depress the mouth. If this be done, no expression of individual features will give elevation to the character. A breadth and squareness in the lower part of the face in vulgar heads, is quite consistent with certain representations of strength and manliness, but if the eyes be diminished, the space between contracted, the expanse of the human countenance is lost, and there can remain no dignity of expression. The largeness of the orbit, with a full eye, is not only a great beauty in itself, as a feature of expression, but it necessarily takes off from the prominence of the cheek bone, which we regard as a deformity, producing a disagreeable effect, not from the jutting out of the bones merely, but from its being accompanied in general by nearness and smallness of the eyes.

The ancients sedulously avoided whatever was deemed characteristic of the brute, and magnified those dimensions of the human countenance which mark the distinguishing attributes of man. They appear to have always endeavoured to imitate some acknowledged beautiful forms of sex or age. First, to have combined the beautiful forms of individuals of the same sex or age, and then to have united the character and beauty of different ages: thus in the Apollo, there is manly dignity in the proportions and attitude, with youthful simplicity in the contour; they even ventured to combine the beauties of both sexes, as in the young Bacchus, or more decidedly in the hermaphrodite. The highest effect of art was, to represent man deified, purified from the gross material of nature, though retaining the form. Of these species of ideal representation, are all the sculptures of the deities. But in these works, the artists did not trust to their own ideas of beauty, nor consider it as an abstract quality. In the antique, each variety had its character established in nature, and every character was an imitation of beauties, which had been observed and studied. It must therefore be impossible to imitate their works, or even to appreciate their high degree of merit, until we are awakened to natural beauty of sex, age, character, and expression. To be susceptible of the beautiful forms of nature, is the first step to the admiration of the antique.

But the artists of antiquity studied the deformities, as well as the beauties of the human countenance; and observing the prevailing lines of a low and disagreeable countenance, compared them with those of the lower order of animals. These observations further assisted them in ennobling the form of the head, by increasing those peculiarities of character which indicated intellect, and by carefully reversing those proportions which produce a resemblance to the physiognomy of brutes. The line of the antique face cannot be the medium or central line of the beautiful in nature, and it is scarcely probable that the line of the nose and forehead of the antique should be the prevailing line in a natural head, or that it should have resulted from a selection of natural beauties of individual form.

A most ludicrous effect may be produced by the union of brutal physiognomy with human expression. The flatness, breadth, and depression of the nose, the direct exposure of the nostrils, and the prominence of the eye, will give the character of the brute, but in

the form of the mouth, and the lines of the eyes, there may be the wild laughter of a low, debased, human countenance.

We have already had occasion to remark, that the expression which is peculiarly human, affects chiefly the angle of the mouth, and the inner extremity of the eyebrow, and it is to these points that we must chiefly attend, in all our observations upon the expression of passion. These are the moveable parts of the face; in these points, the muscular power is, as it were, concentrated, and it is accordingly on the changes which they undergo, that expression is acknowledged chiefly to depend. These parts, however, and all the features of an impassioned countenance, have an accordance with each other. When the angles of the mouth are depressed with grief, the eyebrows are not elevated at the outer angles, as in laughter. When a smile plays round the mouth, or the cheek is elevated in laughter, the brows are not raised, as in grief. It never is by the affection of an individual feature that emotion is truly expressed, there must be a consent and accordance of expression in the whole countenance, systematized and united by the general tone of tension or relaxation.

Attending merely to the evidence furnished by anatomical investigation, all that I shall venture to affirm is this,—that a remarkable difference is to be found between the anatomy and range of expression in man and in animals: that in the former there seems to be a systematic provision for that mode of communication, and that natural language, which is to be read in the changes of countenance; that there is no emotion in the mind of man which has not appropriate signs, and that there are even muscles in the human face, to which no other use can be assigned, than to serve as the organs of this language: but, on the other hand, there is in the lower animals no range of expression which is not fairly referrible as a mere accessary to the voluntary or needful actions of the animal, and that this accessary expression does not appear to be in any degree commensurate to the variety and extent of the animal's passions.

SOME ACCOUNT OF THE LOW PRESSURE ENGINES EMPLOYED IN THE MINES OF CORNWALL AND DEVONSHIRE.

TRANSLATED FROM A MEMOIR BY M. COMBES, A FRENCH ENGINEER.

The high price of the coal supplied to the mines of Cornwall and Devon, has been the main cause of those numerous improvements which, in a period of less than twenty years, (1813 to 1830) have reduced, by one half, the mean consumption of fuel by all the engines employed in these mines, or which, in other words, have produced double the former useful effect, by means of the same quantity of fuel.

The pumping engine of the Consolidated Mines, which has a cylinder of 80 inches inside diameter, receives the steam from three separate boilers. Each of these boilers is a cylinder formed of wrought iron plates, with an interior tube also formed of plates the same thickness as those of the boiler. Inside this tube is placed the fire-grate. The length of the boiler and its enclosed tube is 36 ft., its outside diameter 7 ft.; the thickness of the boiler plates 7-16ths of an inch. The under side of the tube is 8 in. above the bottom of the boiler; the tube is 4 ft. in diameter; the length of the grate is 4 ft. At the end of the grate is a cross brick wall, enclosing that part of the tube which is below the grate, and which serves for an ash hole. This cross wall is built higher than the grate, namely, to the height of 9 inches below the roof of the tube. The currents of flame traverse the whole length of this tube, take a turn at the front part of the boiler, and return underneath, passing through a pipe 4 feet in breadth, by 20 inches in height. This pipe conducts the flame and hot air to lateral channels communicating with the chimney, which is placed behind the boiler. The single chimney, which receives the smoke from the three boilers, is a conical tower with a considerable opening, but of no great height.

The engine is put into work by means of the four following valves: the governor valve, worked by the hands of the engine-man; the steam-admission valve; the equilibrium valve, which opens the communication between the upper and lower parts of the cylinder; and the exhaustion valve, which opens the communication between the cylinder and the condenser.

The moving steam only acts upon the piston to make it descend. Then it raises, by means of the engine beam, the main piston rods of the pumps for draining the mine. During this movement the exhaustion valve is open, so that the space below the piston is in communication with the condenser. When the piston commences its descent, the steam admission valve opens by the action of the jet of cold water, which will presently be described. The piston descends; when it has travelled through a certain fraction of its course, which varies from $\frac{1}{3}$ to $\frac{1}{4}$ of its stroke, the steam admission valve is closed, and the rest of the descent is finished under the decreasing pressure of the expanding steam. When the piston is at the bottom of the cylinder, the exhaustion valve is closed and the equilibrium valve is opened. The piston being now equally pressed by steam, both above and below, is made to ascend by the weight of the pump rods, which, at the same time, force the water into the ascending pipes leading from the parts of the mine which have to be drained. At the end of the upward stroke the equilibrium valve is closed, and the piston remains at rest till the action of the cold water jet opens successively the exhaustion valve and the steam admission valve. Thus the successive strokes of the piston are always separated by a minute interval of rest, the duration of which can be regulated by means of the injection of the cold water.

The cold water apparatus consists of a small pump placed in a reservoir of water. In this pump works a solid plunger piston, whose piston rod is worked by the main beam of the engine. To this rod is attached a bar called the plug-tree, which is provided at proper distances with projecting knobs, called *tappets*. These tappets strike the handles of the levers attached to the steam admission valve, and to the other valves mentioned above, so as to open or close them at the proper time. When the piston of the cold water pump forces water into the condenser, the steam is there condensed, and that steam which was below the cylinder rushes into the condenser to supply the vacuum, and restore the equilibrium. At the same time a partial vacuum is formed beneath the piston, and at this instant the steam admission valve allows the steam from the boiler to press upon the top of the piston, when the downward stroke immediately commences, and the same process is repeated as that already described. The pressure of steam in the boilers is nearly 25lbs. per square inch above the atmospheric pressure. This amount nearly corresponds with two atmospheres and two-thirds, (one atmosphere being represented by a pressure of 15lbs. per square inch.) In order to prevent any waste of heat, the boiler is entirely surrounded by a wooden jacket, or case, between which and the metal of the boiler there is a space of about one foot in thickness, which is entirely filled with saw-dust. The outside of the cylinder is enveloped by a covering of the same kind, and the metal pipes which conduct the steam are also enclosed in square cases filled

with saw-dust. In consequence of these precautions, very little of the heat is lost by radiation, and the temperature in the engine-room is very little more elevated than in the ordinary rooms of dwelling-houses.

The stroke of the steam piston is 11 feet. It is connected to the pump rod by an iron beam, weighing 25 tons, and whose two arms are of unequal length, that to which the steam piston rod is attached being 18 feet 9 inches, whilst the other, from which the pump rod is suspended, is only 14 feet. It follows from this proportion between the length of the two arms that the stroke made by the piston of the pump is 8 feet 2 inches in length.

The pipes and valves afford very large openings for the passage of the steam. Thus the pipe which leads to the condenser is 2 feet in diameter, and that which establishes the communication between the upper and lower parts of the cylinder is 18 inches inside diameter. The diameters of the exhausting and equilibrium valves are respectively equal to those of the pipes in which they are situate. The section of the valve which admits the steam into the cylinder is much smaller than either of the others, being only equal to a circle of 10 inches diameter. The passage of the steam can be further retarded by the regulating valve, which is worked by hand.

The two air pumps have each cylinders of 27 inches diameter. The stroke of their pistons is 6 feet. The vacuum is produced by these air pumps. The vacuum in the condenser, as indicated by the mercurial gauge, which is a glass tube open at the upper end, where it communicates with the condenser, is commonly equal to 28 inches of mercury, and when the exhaustion valve is opened, the mercury does not descend to lower than 27 inches.

The great economy with which the Cornish engines work is not entirely attributable to their vast dimensions, to their excellent condition, and the precautions taken to prevent the waste of heat by surrounding the cylinders and boilers with non-conducting substances. It is evident that much is also due to the system of valves employed, and to the manner of regulating the jet. The exhaustion valve, and the pipes which establish the communication with the condenser, have, as before mentioned, a very great capacity; and as the exhaustion valve is opened before the steam-admission valve, it follows that the tension in the interior of the cylinder, under the piston, ought to be nearly or exactly the same as in the condenser at the moment when the steam is admitted above the piston. This effect does not obtain in ordinary engines, and direct experiments made in Scotland, by applying a spring dynamometer to the lower part of the cylinder communicating with the condenser, have proved that the tension was there maintained much higher than in the condenser when the communication was established by valves and pipes of small bore.

The facility with which the engineer can regulate the time of cutting off the steam by adjusting the position of the long handles which open and shut the valve, permits him exactly to proportion his expenditure of steam to the resistances to be overcome. It is worthy of notice that in these engines working expansively there is no occurrence at the end of the stroke of those shocks and blows, which are very perceptible in the ordinary machines employed in pumping. We ought also to remark, that the management of these engines is never entrusted to a common workman, as in the French mines. The *engineer* charged with the management of a pumping engine in Cornwall is a real constructer of engines. The working engine-man has only control over the regulating valve, and is not allowed to interfere either with the position of the handles, with the counterweights of the pump rods, nor with the action of the jet.

LITHOLOGY; OR, OBSERVATIONS ON STONE FOR BUILDING. By C. H. SMITH.

FROM THE TRANSACTIONS OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

(*Continued from Vol. III. p.* 332.)

Portland stone of the most durable quality is comparatively heavy, of a uniform colour, rather darker than the last described, owing to the quantity of cement of a compact crystalline texture regularly dispersed throughout the pores, and hence it will resist a greater force to crush it or to disintegrate the particles. The following comparison will show the relative peculiarities of good and bad Portland stone; considering the specimens when examined, subject in every respect to the same conditions, such as being equally wet or dry, &c.

Good.	*Bad.*
Preponderance of weight -	Deficiency of weight - -
Dark coloured - -	Light coloured - -
Uniform colour - -	Party coloured - -
Compact and crystalline -	Open and powdery -
Hard to crush - -	Friable - -

What are technically called "glass veins," varying from a line to one inch or more in breadth, often run completely through a block: they retain their original whiteness, while all the remaining surface becomes covered with lichens, or if in London, with soot and dirt; whereas the "party coloured" just named looks more as if some whitish fluid had been sprinkled or thrown upon the stone in patches. Glass veins may be considered unsightly, but they are by no means perishable, neither do they facilitate decay in any way whatever. If they occur in steps, pavements, or any other situations subject to considerable wear, their hardness will soon occasion them to be conspicuously above the ground level; therefore such variation of colour is no defect beyond appearance, and causing a surface to wear irregularly.

According to the observations of Professors Daniell and Wheatstone, at the end of the Report on the selection of stone for building the New Houses of Parliament, the following inference may be drawn; that in all stones of the same class, the heaviest kind, or that which has the greatest specific gravity, is the most durable and best suited for architectural works; this is given as a sort of general rule, although liable to individual exceptions;" but it appears to hold good with all varieties of Portland stone. The specimens from which the following weights have been obtained, are amongst those which have been most tested by exposure to weather.

	Weight per cubic foot lbs.	oz.	drs
Grove quarries, best or lower bed, stands the weather pretty well - - - - -	147	10	11
Waycroft quarries, top bed, best stone in the island	135	8	12
Vearn Street quarry, top bed - -	134	10	0
Castle's quarry, between the flint beds, decomposing quality	132	5	8
Gosling's quarry, bottom bed, decomposes rapidly	131	4	8

If a line be drawn across the southern part of the Island, taking a direction from north-east to south-west, the best stone for standing the weather will be found in the quarries at the north-eastern extremity of such a line; and as you quit this district, and approach the south-western quarries, so in proportion is the stone less and less durable. The most ancient buildings in the neighbourhood, namely a Tudor house in the village of Wakeham, ruins of Portland Old Church, Bow and Arrow Castle, and Sandy's-foot Castle, are generally in excellent condition; they are constructed with stone pre

cisely similar to that of the south eastern-part of the island, where very old quarries, long since deserted, may still be discovered.

In giving a general description of Portland stone, it may be necessary to observe that the entire island contains the same general strata throughout, measuring a collective thickness, between the dirt bed upwards, and the Kimmeridge clay beneath, of from twenty to thirty feet of actual block stone. I shall endeavour to describe the various strata, chiefly as they occur in the north-eastern district, or that part of the island from whence the best stone is procured; and afterwards notice the principal differences which characterize the several beds of stone in some other quarries in the island.

About four feet below the grass commences the first stratum of thin rubble, from half an inch to four inches in thickness, and occupying a depth of from four to ten feet: the best is occasionally used for rough pavements, and as a substitute for slates or tiles for roofing the humbler buildings in the island. Beneath this is the celebrated "dirt bed," containing the fossil roots, stumps, and branches of trees, mostly in the precise situation where they grew, fructified and perished. The top-cap is a light-coloured, fine-grained, dense limestone; shattered, full of cracks, easily separated into many small lumps, and too hard for useful purposes. The skull cap is irregularly compact and open; large blocks, occasionally containing flints and cherty nodules, may be obtained tolerably sound, rather hard, the grains well cemented together; and there is good reason to believe it to be a durable stone, well suited for bold massive structures, where little or no ornament is required. The roach, both of the top and bottom beds, is always imperceptibly incorporated with the freestone, which is invariably situated beneath it. The roach is peculiar, on account of its composition being in every respect the same as the stone with which it is gradually united, but replete with cavities left by shells, some entire, others partly decomposed. Although this stone is so completely full of holes as to present the idea of its having been eaten or partly decomposed by insects, nevertheless in the roach of the top bed, the grains which compose the solid portion are united with so firm and excellent a cement of carbonate of lime as to render the whole extremely durable. Such as is nearest to the freestone is generally finer, that is, the holes are smaller; this kind has been used at Portland in the construction of the new church built in 1766, and in part at Sandy's-foot Castle, near Weymouth, built in the time of Henry VIII.; in both cases the original tool marks are still apparent. It has been used, in later times, in very trying situations, such as the waterfall from the Serpentine river in Hyde Park, also in that part of the new bridge over the Thames at Kingston from the foundation to several feet above the water, and it appears to resist these several tests amazingly well.

The most perfect quality of Portland stone, known to the merchants and quarrymen by the name of Top-bed, is situated about midway between the top and bottom of the quarry, immediately beneath and attached to the roach just described. This bed varies in thickness from five to about seven feet, although occasionally blocks are obtained upright in the north-western quarries, measuring from ten or eleven feet, but the lower ends of those blocks will very seldom stand the weather. A small portion of the roach is generally left on the end of long blocks, which may be unsightly; but it indicates to a certainty which way the stone lay in the quarry, the roach invariably being uppermost, and nearer to the roach the better or more durable the stone; consequently, in very exposed situations, it is advisable rather to leave a few holes of the roach in the finished mason's work, than to subject the lower part of the block, which is always finer grained and apparently better stone, to all changes of temperature and severity of the weather; because the end farthest from the roach has always a tendency to decompose first, especially if the block be unusually long.

A layer of chert or imperfectly formed flint, about four inches thick, frequently containing numerous shells, and cavities from animal remains, is always found adjoining the lower part of the top-bed; under which six or seven feet thick of rubble or coarsely formed stone in several beds rests upon the roach of the bottom-bed. To all appearance this roach is the same as that upon the top-bed, but it differs essentially in being much less durable, and is on that account totally unfit for external uses. The bottom-bed, or as it is sometimes erroneously called "best-bed," is the lowest stratum in the quarry, and averages about six feet thick. The component parts are the same as those of the top-bed, but not so well cemented together, being always more or less in a loose and powdery state, consequently, if exposed to the weather it very soon decomposes. Some of the bottom-bed Portland is so soft to work, beautifully fine grained, and homogeneous, that it may be considered equal to Maltese, Painswick, Tottenhoe, or any of the superior free-stones that are now so often used for Gothic monuments, altar or organ screens, florid and shrine work, or any other small and delicate carving for interior decorations securely protected from the weather.

The stratification varies in thickness from north to south. This is conspicuous in the Way-croft quarries, where the top bed is double the thickness of the corresponding bed in the Grove quaries; the former is perhaps the best stone in the island, whereas the latter is so inferior that it is rarely or never used. Between the top and bottom beds in the Way-croft, is a quantity of thick rubble in several strata, collectively answering to a single bed called "curf" which occurs in a compact state, about five feet thick only, in the Grove or southernmost of the quarries on the east cliff. At the Castles, and quarries on the west cliff, the beds are not so distinctly separable: the roach is occasionally incorporated with the freestone in beds where there is none to correspond with it in the stone of the north and east cliffs. The joints or fissures are what the quarrymen call "gullies;" they are always tolerably vertical, and extend considerably in various directions, with little or no interruptions; they are very narrow in the lowest bed, and widen upwards through all the solid rocks to about two to three feet at the highest part; they never reach above the top cap, although the effect of separation is conspicuous above the dirt bed, where the thin rubble generally appears disturbed precisely over the gully, as if by some subterranean movements, without the effect being felt by any of the superincumbent strata. The distance of these gullies from eachother varies from three to fifteen feet.

By thoroughly investigating the physical qualities, and rationally observing the various peculiarities in the several beds of Portland stone, it will be evident that they all possess characters essentially different: some are applicable to many uses, but each has at least one particular adaptation to which it is most suited; and it is the interest of architects, stone merchants, and quarrymen to seek every opportunity for obtaining correct information as to their fitness. A block of stone may be applied to a particular purpose, and placed in a situation for which it is quite unsuitable, thereby considerably assisting its decomposition; in which case a good material has probably been misapplied, and then unjustly pronounced to be defective; we might as well expect the wood of every kind of fir-tree to be equally durable, in whatever situation it may be placed; but experience teaches us that the white varieties of pine or deal are admirably adapted for furniture, mouldings, and the generality of interior joiner's work, and that they will decay rapidly if exposed in a damp

situation; yellow deal and Memel timber, which are also fir-trees, will last infinitely longer subject to the same variations of weather.

Merely for want of a right understanding, the present system of the Portland trade is prejudicial to the interest of all parties concerned in it. To get at the top bed, which is the only marketable stone of a really good quality, the entire bed of skull-cap is obliged to be removed; and notwithstanding it is said to be durable, besides well adapted for bold massive structures in exposed situations, it has never been applied to any such useful purpose. The reason assigned is, its quality being rather hard and sometimes coarse. The merchants never, under any conditions whatever, find a purchaser for this somewhat valuable material; therefore, to get it out of the way, it is either buried in an old quarry, or thrown off the cliffs towards the sea, at a considerable expense for labour, which must of course be charged upon the stone that is of a saleable quality. There is also an objectionable system of traffic, carried on to a vast extent in London, arising sometimes from pure ignorance, but I fear frequently from sordid motives; namely, that of selling and using bottom bed-stone as a material for external use, as for pavements and steps, for which purpose its softness will occasion it rapidly to wear away. Whoever is well acquainted with the quarries and with the different kinds of Portland stone, must admit that a great temptation is offered to stone merchants to supply the markets with bottom bed-stone without designating it as such. A very large proportion of the expense of procuring the good stone is caused by the necessity of removing the superincumbent rubbish: but when this is accomplished, and the really good stone sent to market, a comparatively small expense of labour will enable the quarrymen to get at the lowest strata, which is a material sure to meet with ready sale in the market, because it is generally the most beautiful looking stone, much softer and consequently much less expensive to work than stone of a more durable quality. Hence masons and contractors are tempted to use it for all purposes, regardless of situation or exposure to the inclemency of the seasons.

It is desirable that some plan should be adopted in order to secure a certain co-operation and right understanding between all persons concerned in the use of stone as applied to buildings, so that the public may not be disappointed by the premature decay of an edifice which had been erected under the impression of its lasting for ages. If a merchant or vendor of articles of daily consumption supply his customers with inferior goods, when only those of the best quality are ordered, such a practice is soon detected, and he is punished either by having them returned, or by the loss of his customers when they discover that his goods are not of the quality intended; but when defective stone is used in a building, the failure is perhaps not very evident during the lifetime of the parties concerned in its erection, and cannot therefore be detected till too late for redress.

It has been deemed expedient for the protection of the public, to legislate between the buyer and seller of certain articles, the quality of which may be determined at once by persons of the meanest capacity. The coal merchant, for instance, is compelled to sell by certain regulations laid down by Act of Parliament, and why should not the mason or stone merchant be under the same obligation, to deliver only such articles as they engage to supply, the quality of their goods being much more difficult to ascertain?

A specification of mason's work should contain not merely the popular name of the stone, but also the correct name of the quarry, and of the particular stratum or bed, if there be an evident difference in such quarry; a sample of which should be selected by the architect, and retained in his possession, but open to the inspection of the contractors previously to making their estimates, with an understanding that the whole of the stone used is to be of a quality not inferior to the sample. For the satisfaction of the contractor, as well as the architect, when the contract is being settled, the sample of stone might also be signed and sealed, to remain for comparison with the stone used in the building till the work be completed.

If the natural texture or disposition of the particles of two or three stones could be conveniently examined upon an extremely magnified scale, no person would imagine that to be the most durable which had scarcely any cement to unite the grains together. It requires a great stretch of philosophical investigation to understand that, whatever the cement may be, that stone which contains the largest quantity of cement in the interstices between the grains will certainly be least affected by external influences. In a stone which is very open and porous, each component grain on the outside has very nearly all its surfaces exposed to the action of mechanical violence, such as the freezing of water after being forced into or absorbed by the external portions of the stone. The solvent power of water, even in its simplest state, is a fact so notorious, that the mere allusion to it seems almost needless: and the atmosphere, especially in England, is always charged with a sufficient quantity of aqueous vapours to engender inevitable decomposition in a stone of a slightly cemented and powdery nature. The chemical action of a humid atmosphere, in conjunction with powerful winds and driving rains, produce a decomposition of the entire surface of limestones, commencing with the particles which have the weakest attachment; whereas the same action, if all the other things be equal, will only affect the cementing substance of sand-stone, the grains of quartz in it being comparatively indestructible; but, in either of these cases, whether chemical or mechanical, the stone that is closest in texture and most crystalline will also be the least porous, consequently it will present the largest portion of matter in a given space to resist decomposition; but, like the fable of the "bundle of sticks," the more the grains are separated from each other the more readily will the whole be destroyed. A stone may be very porous, consequently very absorbent, and yet sufficiently durable for architectural purposes; its durability depends on the cement being strong enough to resist the mechanical forces to which I have alluded. By this statement, I do not mean to infer that absorption is a desirable quality; a stone may be comparatively like a sponge, and yet last for ages without any material decomposition; but if two kinds of stone were equal in every other respect, that which will soak up least water will certainly be the most durable. Few mineral substances will hold more water than a good graystock brick, which will probably last as long as any stone, because its component parts are held together by a strong vitreous cement; but a clinker-brick is less absorbent, because it contains a greater quantity of the same kind of cement, and is therefore less likely to yield to the same atmospheric influences.

In almost every limestone quarry or locality, but more particularly amongst the oolites, there are different qualities of stone, some tolerably good, others very bad. The principal requisite is, judgment to select that which is best. I have already pointed out the necessity of this qualification for the Portland quarries, and extraordinary instances of the want of it may be found in buildings of stone from the Doulting quarries; for example, many parts of Wells Cathedral and the adjacent buildings are in a very decomposed state, whereas Glastonbury Abbey, built of similar stone, and no doubt from some of these quarries, is in an extremely perfect condition, although two or three hundred years older than the buildings at Wells.

TABLE OF PROPORTIONS OF CLYDE MARINE STEAM ENGINES—FRAMES.

	BRITISH QUEEN. *Girdwood and Co.*	DON JUAN. *Girdwood and Co.*	HECLA AND HECATE. *Scott, Sinclair, and Co.*	DEVONSHIRE & DUKE OF CAMB. *Girdwood and Co.*	BRUCE. *Caird and Co.*
Architectural order of framing	irregular	Doric	Gothic	Doric	Doric
Undermost columns of crank framing, malleable iron?	yes	no	no	no	no
Diameter of at top	9 in.	1 ft. 1⅛ in.	11 in.	12 in.	11 in.
Diameter of at bottom	10 in.	1 ft. 4⅜ in.	11½ in.	14½ in.	13 in.
How secured to sole plate	with socket	bolted	bolted	bolted	bolted
How secured to entablature	„	„	„	„	„
How many pieces in each frame	5	3	2	3	3
Where united	above columns	above columns	above air pump	above columns	above columns
How united	bolts and keys	bolts and keys	bolts and hoop	bolts	bolts
Number of bolts in horizontal junction	none	10	none	10	10
Number of bolts in perpendicular junction	„	none	14	none	none
Tapped in?	no	no	yes	no	no
Diameter of bolts	none	1½ in.	1½ in.	1½ in.	1½ in.
Pitch of thread		¼ in.		¼ in.	
Breadth of nut		3 in.	3 in.	2½ in.	2½ in.
Depth of nut		2½ in.	2½ in.	2½ in.	2 in.
Necks of bolts turned and holes widened out?	no	no	no	no	no
Paddle shaft plummer blocks cast on?	„	„	yes	„	„
Brackets for valve and p. motion cast on?	yes	„	„	„	„
Distance from centre to centre of crank columns fore and aft	4 ft.	3 ft. 9¾ in.	3 ft. 10 in.	3 ft. 6 in.	3 ft. 4 in.
Distance athwartships		5 ft.	4 ft. 6 in.	4 ft. 9 in.	4 ft.
Sole of columns, length of	7 ft. 9¾ in.	7 ft.	6 ft. 9 in.	5 ft. 11¾ in.	5 ft. 6 in.
„ breadth of	1 ft. 6 in.	1 ft. 4½ in.	1 ft. 3 in.	1 ft. 2 in.	1 ft. 1 in.
„ thickness of	5¾ in.	5 in.	4½ in.	4¾ in.	4 in.
Diameter of upper columns at bottom	9½ in.	11⅜ in.	12½ in.	10 in.	9 in.
„ „ at top	8 in.	10 in.	11½ in.	8¾ in.	7¾ in.
Malleable iron rods passing through columns?	no	yes	no	no	no
Attached at underside to bolt passing through bottom?	„	„	„	„	„
How attached		with socket			
Foot cast on diagonal stay to meet condenser?	no	yes	yes	yes	no
Upright cast on diagonal stay for starting shaft?	yes	no	„	no	„
Thickness of web of diagonal stay	3 in.	2¾ in.	2½ in.	2 in.	2 in.
Breadth of over top	9 in.	9¾ in.	9 in.	8½ in.	7 in.
Depth of at crank columns	5 ft. 6 in.	4 ft. 9½ in.	incommensurable	4 ft. 3¾ in.	4 ft. 0 in.
Depth of at smallest part near cylinder	1 ft. 7 in.	1 ft. 8 in.	1 ft. 9 in.	1 ft. 5½ in.	1 ft. 3½ in.
Depth of perpendicular flange to take cylinder	1 ft. 8 in.	1 ft. 10⅜ in.	2 ft.	15⅜ in.	1 ft. 4 in.
Breadth of	12 in.	12 in.	9½ in.	9½ in.	8¾ in.
Length of horizontal flange	13½ in.	10½ in.	8 in.	11½ in.	8 in.
Breadth of	12 in.	12 in.	9½ in.	9½ in.	8½ in.
Thickness of metal in perpendicular flange	3½ in.	3 in.	3½ in.	3 in.	2½ in.
Number of keys in	none	2	none	2	none
Material of keys		steel		steel	
Number of bolts in	6	4	4	4	4
Diameter of bolts	1⅜ in.	1⅜ in.	1½ in.	1½ in.	1½ in.
Bolts made taper and holes widened out?	no	yes	no	no	no
Pitch of thread	¼ in.	¼ in.		¼ in.	
Breadth of nuts	2¾ in.	2½ in.	2½ in.	2½ in.	2½ in.
Depth of nuts	2½ in.	2½ in.	2½ in.	2½ in.	2½ in.
Thickness of horizontal flange	3¾ in.	3½ in.	3½ in.	3½ in.	3 in.
Number of keys in	none	none	none	1	none
Material of keys	„	„	„	steel	„
Number of bolts in	3	2	1	2	2
Diameter of bolts	1¾ in.	1⅜ in.	2 in.	1½ in.	1⅜ in.
Bolts made taper and holes widened out?	no	yes	no	no	no

The steadiness of a framing depends chiefly upon the fitting: fitting strips should be altogether discarded, and the joining surfaces should both be planed: the holes also should all be widened out with a little taper, and the bolts turned exactly with the same taper and drifted in. It is necessary to be careful, however, that no undue strain be thrown on the conical part of a slightly tapered bolt, else the bolt will act as a wedge of small inclination, and will be very apt to split the iron in which it is fixed; to obviate this, all the taper bolts in a framing should have a nut on each end, so that when driven home the nut answering to the head may be screwed up, and take all further strain that may be applied off the conical part of the bolt. In the pitches of screws there is great irregularity among many engineers—Messrs. Maudslay's proportions of screws are, we think, among the best; they are almost identical with those presented by Mr. Whitworth to the Institution of Civil Engineers, of which an account will be found in the Journal of that Society.

To the Gothic order of framing we have many objections: its rounded surfaces makes the attachment of any auxiliary fastening difficult: it is more subject to cracks and flaws, from unequal contraction, than any other, and more expensive and troublesome to mend when broken. The framing of the Great Western is, we understand, broken in many places; and that of the Thames (we think), also by Messrs. Maudslay, has already been so much injured, that a considerable part of it has had to be renewed. At the same time Mr. Robert Napier's framing is Gothic, and we never heard of the framing of any of his engines having given way.

The Doric order of framing is free from many of the objections which attach to the prevalent forms of Gothic; but we think *it* also is ineligible. It awakens dangerous architectural associations, and calls up expectations which it cannot satisfy. This is in fact the fault, in a greater or less degree, with all architectural framings we have yet seen. If an ingenious carver of our acquaintance, were to impart to us some portion of his taste and invention, we might, perhaps, be induced to favour the world with a new species of engine architecture.

REVIEWS.

The Temple Church; by C. G. Addison, Esq., Author of the History of the Knights Templars. London: Longman & Co. 1843. 8vo. pp. 127.

A Glance at the Temple Church. By Felix Summerly. London: Bell & Wood. 1842.

Mr. Addison, the Historian of the Knights Templars, has supplied, in the interesting volume before us, all the information that can be required by the public concerning the architecture and general history of the Temple Church. The restoration of this beautiful and historically important relic of the middle ages, just completed by the two learned societies who occupy its precincts, at an outlay of £50,000, is in itself an era in the history of ecclesiastical architecture. There has long been an increasing desire for the the preservation and restoration of our ancient national buildings, especially those devoted by our forefathers to pious uses. Many have been either partially or entirely reconstructed with greater or less effect, but none so completely nor with so much taste as the Temple Church; nor is there perhaps any other building in this country, considered in reference to history, European in general, and English in particular, or simply as a specimen of early ecclesiastical architecture, equally worthy of the same attention, or the outlay of so large a sum of money. That it will greatly tend to improve the public taste, and excite or encourage antiquarian research, cannot be doubted, and those persons will be especially interested who, in addition to an examination of the building itself, avail themselves of the assistance offered in Mr. Addison's interesting volume.

In the first portion of the work the author gives a brief history of the Temple subsequent to the dissolution of the order of the Knights Templars, that is, from the time when it was first occupied by the Lawyers.

"This curious result was brought about in the following manner.

"Both before, and a very considerable period after, the Norman conquest the study of the law was confined to the ecclesiastics, who engrossed all the learning and knowledge of the age. In the reign of King Stephen, the foreign clergy attempted to introduce the ancient civil law of Rome into this country, as calculated to promote the power and advantage of their order, but were resolutely resisted by the king and the barons, who clung to their old customs and usages. The new law, however, was introduced into all the ecclesiastical courts, and the clergy gradually abandoned the muncipal tribunals, and discontinued the study of the common law. Early in the reign of Henry the Third, episcopal constitutions were published, forbidding clerks and priests to practise as advocates in the common law courts, and towards the close of the same reign (A. D. 1254) Pope Innocent IV. forbade the reading of the common law by the clergy in the universities and seminaries of learning, because its decrees were not founded on the *imperial constitutions*, but merely on the customs of the laity.

As the common law ceased to be studied and taught by the clergy, who were the great depositaries of legal learning, as of all other knowledge in those days, it became necessary to educate, and train up a body of laymen, to transact the judicial business of the country; and Edward I. in the twentieth year of his reign (A. D. 1292), in order to encourage and promote the study by laymen of the ancient municipal law of England, authorized the chief justice and other judges of the Court of Common Pleas to confer the exclusive privilege of pleading causes upon a certain number of persons learned in the laws, who were to be selected from every county in England; the king and his council deeming the number of one hundred and forty to be sufficient; but it was left to the discretion of the said justices to add to that number or to diminish it, as they should think fit.

At this period the Court of Common Pleas, which then had exclusive jurisdiction over all civil causes, had been fixed at Westminster, which brought together the students and professors of the common law at London, and about the period of the imprisonment of the Knight Templars, (A. D. 1307) the advocates of that court, and the students who were candidates for the privilege of pleading therein, appear to have fallen into a sort of collegiate order, and to have formed themselves into a society under the sanction of the judges, for the study and advancement of the science of the law. The deserted convent of the Temple, seated in the suburb of London, away from the noise and bustle of the city, and presenting a ready and easy access by water to Westminster, appeared a desirable retreat for the learned members of this important legal society; and measures were taken by them to obtain possession of it."

Upon the abolition of the order of the Temple by the Pope, Edward the Second granted it to Aymer de Valence, Earl of Pembroke. It was, however, afterwards claimed by escheat, by Thomas Earl of Lancaster, and to him was resigned by the request of the King, on the 3rd October, 1315. With this powerful prince the Lawyers made interest, and became his lessees. Upon the attainder and execution of the Earl of Lancaster, the property again reverted to the Crown, and was again granted to the Earl of Pembroke, who died without issue. It was then given to Hugh le Despencer, and after his execution once more reverted to the Crown at the commencement of the reign of Edward the Third. By the exertions of the pope and the bishops, and upon the plea that the church, the cloisters, and other places within the Temple were consecrated, and dedicated to the service of God, the Knights Hospitallers of Saint John, or Knights of Rhodes, succeeded in obtaining posession of these sacred places, which they retained till the dissolution of the order. The subsequent history of the Lawyers, the importance they assumed, and the division of the society into the Inner and Middle Temple, are briefly described by Mr. Addison. The adoption of the customs of their predecessors, the Templars, is curious and worthy of remark.

"From the time of Chaucer to the present day, the professors of the law have dined together in the ancient hall of the knights, as the military monks did before them; and the rule of their order, requiring 'two and two to eat together' and 'all the fragments to be given in brotherly charity to the domestics,' is observed to this day and has been in force from time immemorial. The attendants at table are still called *paniers*, as in the days of the Knights Templars. The leading punishments of the Temple, too, remain the same as in the olden time. The ancient Templar, for example, for a light fault was 'withdrawn from the companionship of his fellows,' and not allowed 'to eat with them at the same table,' and the modern Templar for impropriety of conduct, is 'expelled the hall' and 'put out of commons.' The brethren of the ancient fraternity were, for grave offences, in addition to the above punishments, deprived of their lodgings, and were compelled to sleep with the beasts in the open court; and the members of the modern fellowship have in bygone times, as a mode of punishment, been temporarily deprived of their chambers in the Temple for misconduct, and padlocks have been put upon their doors. The Master and Chaplain of the Temple, in the time of the Knights Templars, exercised the power of imprisonment and expulsion from the fellowship, and the same punishments have been used down to a recent period by the Masters of the Bench of the modern societies.

"There has also been, in connexion with the modern fellowship, a class of *associates* similar to the associates of the ancient Templars. These were illustrious persons, who paid large sums of money, and made presents of plate to be admitted to the fellowship of the Masters of the Bench; they were allowed to dine at the Bench table, to be as it were honorary members of the society, but were freed from the ordinary exercises and regulations of the house, and had at the same time no voice in the government thereof.

"In the sixth year of the reign of Edward III. (A. D. 1333,) a few years after the lawyers had established themselves in the convent of the Temple, the judges of the Court of Common Pleas were made Knights, being the earliest instance on record of the grant of the honour of knighthood for services purely civil; and the professors of the common law, who had the exclusive privilege of practising in that court, assumed the title or degree of Freres Serjens or Fratres Servientes, so that knights and serving brethren, similar to those of the ancient order of the Temple, were most curiously revived, and introduced into the profession of the law."

The description of the Temple Church, of which the larger proportion of Mr. Addison's work consists, is writen in a pleasing style, and contains much valuable information. Having noticed the manner in which the church was defaced at the time of the Reformation, and the discoveries made during the restoration, he conducts his readers first into the Round Tower, and then into the Square Church, after which he gives them a view of the much-dreaded peni-

tential cell. Every object as it is presented to the view calls up some pleasing association, until the man feels himself to be surrounded, not with the dim visions of the chivalric age, but with all the realities of that superstition and fanaticism which so fearfully distinguished the order that professed to be the servants of the Gospel of peace, though they symbolised upon their banners the passions which that Gospel was revealed to destroy. The age in which we live is, it may be hoped, too far advanced in a knowledge of the elements of moral and religious character to allow the undue inference of the external forms of devotion, so fatal in past ages to true piety and the independence of the human mind. There have been periods when the erection of such a building as the Temple Church might have been considered as a new fetter upon the moral character of society, a means of perpetuating the control of formality and superstition. The arts are most honoured when they become the servants of religion, but are at enmity with God and man when they exert an influence prejudicial to her control over the affections. It is not to fetter the spirit of religion and hold it under the restraint of external objects that efforts are now being made to restore the ancient ecclesiastical structures in every part of the kingdom, but rather to sustain and strengthen its influence by recollections of the events and customs of the ancient British Church, which are sometimes profitable for warning and sometimes for example. Never may it be the reproach of this nation that we have dwelled in our "ceiled houses," when the Temple of God was lying waste.

The restoration of the Temple Church is a fine specimen of art, and although the critic may find something to blame, he must be of a more morbid temperament than is common to even that class if he does not admit that there is much more to approve. We will leave our author to describe the effect of the several parts.

"The Temple Church is entered by a beautiful semicircular arched doorway, an exquisite specimen of the Norman style of architecture, still unfortunately surrounded and smothered by the smoke-dried buildings of studious lawyers. It is deeply recessed and ornamented on either side with columns bearing foliated capitals, from whence spring a series of arched mouldings, richly carved and decorated. Between these columns project angular piers, enriched with lozenges, roses, foliage, and ornaments of varied pattern, and curious device. The upper part of these piers between the capitals of the columns is hollowed out, and carved half-length human figures, representing a king and queen, monks and saints, have been inserted. Some of these figures hold scrolls of paper in their hands, and others rest in the attitude of prayer. Over them, between the ribs of the arch, are four rows of enriched foliage, springing from the mouths of human heads.

"Having passed this elegant and elaborately-wrought doorway, we enter that portion of the church called by the old writers THE ROUND, which consists of a circular area formed by a round tower resting on six clustered columns, and of a circular external aisle or cloister, connected with the round tower by a sloping roof on the outside, and internally by a groined vaulted ceiling. The beauty and elegance of the building from this point, with its circular colonnades, stained windows, and long perspective of architectural magnificence, cannot be described—it must be seen, p. 53.

"The entrance from the Round to the oblong portion of the Temple Church is formed by three lofty pointed arches, which open upon the choir. The mouldings of these arches possess great beauty and elegance, and the central arch, which forms the grand entrance to the choir, is supported upon magnificent Purbeck marble columns. The mode of connecting or combining the circular and quadrangular buildings is perfectly unique, and is at once simple, graceful, and elegant. The lofty and deeply recessed arches, with their rich mouldings, marble columns and capitals, and graceful decorations, tastefully harmonise with the other portions of the sacred edifice, and shew with what consummate skill and correct taste the square church was grafted upon the circular, so as to combine the whole into one splendid building.

"The scene presented to the beholder from the grand central archway is certainly one of the most beautiful that was ever fashioned by the hand of man. In front of the observer stands the high altar, glittering with gold and marble, and adorned with sculpture and painting, and immediately above, and on either side, extend the three east windows filled with the richest stained glass. Graceful columns of dark grey marble support a groined vaulted ceiling, richly and elaborately painted, and numerous elegant shaped triple lancet windows, of equal height and size, diffuse a broad flood of light throughout the sacred edifice. This portion of the church, which was consecrated in the year 1240, is a large, lofty, and high structure, consisting of a grand central compartment and two side aisles, formed by eight clustered marble columns, which support a groined vaulted ceiling. It presents to us one of the most pure and beautiful examples in existence, of the early pointed style which immediately succeeded the mixed order of the gothic architecture visible in the Round. The numerous elegantly shaped windows, the exquisite proportions of the slim marble columns, the beauty and richness of the architectural decorations, and the extreme lightness and airiness of the whole structure, give us the idea of a fairy palace. The marble columns supporting the pointed arches of the roof, four in number on each side, do not consist of independent shafts, banded together as in the Round, but form solid pillars of great elegance and beauty. Attached to the walls of the church in a line with these pillars, are a series of small clustered columns, composed of three slender shafts, the central one being of Purbeck marble, and the others of Caen stone; they are bound together by a band at their centres, and their bases, which are of Purbeck marble, and rest on a stone seat or plinth, which extends the whole length of the body of the church. These clustered columns, which are placed parallel to the large central pillars, are surmounted by foliated capitals, from whence spring the groined ribs traversing the vaulted ceiling of the roof. The side walls are thus divided into four compartments on either side, which are each filled up with a triple lancet-headed window, of a graceful form, and richly ornamented. It is composed of three long narrow openings, surmounted by pointed arches, the central arch rising above the lateral ones. The mouldings of the arches rest upon four slender marble columns, which run up in front of the stone mullions of the windows. The great number of these windows, and the small intervening spaces of blank wall between them, give a singular lightness and airiness to the whole structure."

Being well satisfied with the manner in which Mr. Addison has performed his somewhat difficult task of describing the Temple church, we have given him an opportunity in these long quotations of speaking for himself, little doubting that this will be his best recommendation to our readers. The monumental remains which he has noticed, will on some future occasion probably come under our consideration in connection with some remarks upon the history of the Templars, and their influence upon the ecclesiastical architecture of the middle ages.

Mr. Summerly's pleasing and instructive Guides to Westminster Abbey and Hampton Court Palace, are deservedly well known. They are small and inexpensive publications, calculated to draw the attention of the multitude to the most remarkable objects in those buildings, and thus to improve the public taste by familiarizing the mind with some of the finished specimens of architecture and the arts in this country. "The Glance at the Temple Church" has the same object, and should be read by every one who intends to visit this still venerable structure, to prepare him to appreciate what he will see; and he who has already visited it, should do the same to remind him of the objects of interest. The value of this little hand-book is enhanced by a bold sketch of the exterior elevation, and several views of parts of the interior. The condensed style in which Mr. Summerly has traced the history of this church, its times, and the recent restoration, may be judged from the following quotation:

"A brief history of the Templars in England, and of this church, may be read in the rude effigies of the successive kings during whose reigns they flourished, now painted on the west end of the chancel. At the south corner sits Henry I. (A.D. 1128), holding the first banner of the crusaders, half black, half white, entitled "Beauseant;" white typifying fairness towards friends; black, terror to foes. This banner was changed, during the reign of Stephen (A.D. 1146), for the red cross.

"And on his brest, a bloodie crosse he bore,
"The deare remembrance of his dying lord.

"The round part of the Temple Church was built in the reign of Henry II. (A.D. 1185). Both king and church are represented by the third figure. Before this time, the chief house of the Knights Templars

in England stood on the site of the old Southampton House, without Holborn Bars.

"The old historical legend which recorded the building of the present round Church, was formerly inscribed over the door which leads into the aisle of the round Church. It is now painted inside above the western doorway.

"Richard I., with the sword which he wielded as a Crusader, and John his brother, are the next kings; and in the north aisle is portrayed Henry III., holding the two churches, the chancel, or square part, having been added in his reign, and consecrated on Ascension day, 1240. About this time the Crusades failing of success, and over costly, lost their once magical influence, and the prime supporters of the principle—the Templars—were suppressed, A. D. 1308."

Turning and Mechanical Manipulation. By Charles Holtzapffel, Vol. I. London, 1843.

ALL the mechanical arts are more or less dependent upon turning, and had it been less successfully studied, the valuable inventions of the age would have been classed among the ingenious theories. The steam-engine itself would have been a useless discovery without the assistance of the lathe; and, but for this simple yet perfect machine, society could not possibly have reached its present enobled condition. But, notwithstanding the great importance of the art, no really valuable treatise has yet appeared on the subject. Mr. Holtzapffel's work, the first volume of which is now before us, promises to supply the want which has been so long felt, not only by the amateur, but also by the intelligent artizan. It is not, perhaps, conferring more praise than is deserved, when we state that there is no man in this country better qualified for such an undertaking—and we have little doubt that the work will soon find a place in every turning-shop in the country, as well as on the book-shelf of every amateur.

The volume already published is on the quality of materials generally, and on the art of selecting, preparing, and working them. The author intends to complete his treatise in five volumes, so arranged as to suit the wishes and convenience of all classes of amateurs; but, upon this subject, he had better speak for himself.

"Many persons have pursued these arts as a source of active and industrious employment, accessible at all hours, in the intervals between other pursuits; a source of amusement that renders the amateur independent of the ordinary artizan for the supply of a great variety of works of utility for the common wants of life, including those constantly required either for the domestic establishment, or those personally experienced by its inhabitants, of every age or choice of occupation.

"Other amateurs have pursued the art of turning as a source of elegant recreation, and of inventive and skilful pastime; one closely allied to the fine arts, insomuch that its greatest success depends upon a just appreciation of sculpture and painting, and for the attainment of which the education and opportunities of the man of independent leisure eminently qualify him; whilst the embellishment of the drawing-room, cabinet, and boudoir, stimulate him to apply his knowledge and skill to that end, and in which he frequently administers at the same time to the extension and cultivation of tasteful form in ordinary manufactures.

"There is also a class of amateurs who have preferred the pursuit of such branches of art as unite with taste and design a certain admixture of the more exact acquirements connected with mathematical and general science, and the arts of construction; and who have devoted their time and ingenuity to the production of models, embracing a variety of objects relative to the arts of peace and war; and also various machines and apparatus; or in the still more praiseworthy attempt of improving those already in use, or in inventing new ones; and the services that have been thus rendered by men of independence and education are neither few nor slight. In all such cases the progress is more rapid and certain when the pencil is devoted to the production of the drawing, and the tool to the formation of the rough model, as proceedings in common, prior to making the finished apparatus.

"In selecting topics from the very numerous branches of the subject, the author has endeavoured to supply the more immediate wants of all classes of amateurs, and under these circumstances he has thought it best for the convenience and choice of the general reader, to separate the practical division of the subject of turning into three distinct and different parts, to be preceded by two general or preliminary volumes, to contain miscellaneous information, required nearly alike in the pursuit of every branch of the mechanical arts."

The first of these volumes we are now about to examine; the second is to contain the principles of construction, and the purposes of cutting tools, with abrasion, and miscellaneous processes. The third volume in the series is to explain the principles and practice of hand or simple turning; the fourth, ornamental, or complex turning; and the fifth is to be devoted to amateur engineering.

The volume before us exhibits a great practical knowledge of materials, and the modes of preparing them for mechanical operations. The author has wisely availed himself of the information collected by previous authors; but this is not all that he has done, for the original and acute observations of a practical man are easily detected in every page. Nor is it to the turner only that this book will be of value, for every man engaged in the pursuit of practical science will find something applicable to his own business, and enough to repay his perusal. The several materials are naturally arranged under the general designation of vegetable, animal, and mineral, and in addition to a very full and useful description of the several substances, with their uses and application, the author has given an alphabetical and descriptive catalogue of the woods, metals, and alloys.

Nearly all the materials used in the mechanical arts are occasionally brought into the lathe, but they are chiefly of vegetable or mineral origin. Wood is the principal vegetable substance, but the several kinds differ greatly in structure, colour, and other physical qualities; though, by the turner, they are all classed under the two general comparative terms of hard and soft.

"The very different tools used by the turner," says Mr. Holtzapffel, for the soft woods and hard woods respectively, may have assisted in fixing these denominations as regards his art; a division that is less specifically entertained by the joiner, who uses the same tools for hard and soft woods, except a trifling difference in their angles and inclinations; whereas the turner employs for the soft woods tools with keen edges of thirty or forty degrees, applied obliquely, and at a tangent to the circle; and for the hard woods, tools of from seventy to ninety degrees upon the edge, applied as a radius, and parallel with the fibres, if so required. The tools last described answer very properly for the dense woods in which the fibres are close and well united; but applied to the softer kinds, in which the filaments are more tender and less firmly joined, the hard-wood tools produce rough, torn, and unfinished surfaces."

Woods are also strongly distinguished from each other by the degree of their elasticity, which has caused the adoption of another general classification into elastic and non-elastic woods. Mr. Holtzapffel has given some interesting examples of the uses to which various kinds of wood are applied from the greater or less degree of elasticity they severally possess.

"Fishing rods, unless made of bamboo, have generally ash for the lower joint, hickory for the two middle pieces, and a strip out of a bamboo of three or four inches diameter as the top joint. Archery bows are another example of elastic works; the 'single piece bow' is made of one rod of hickory, lancewood, or yew-tree, which last, if perfectly free from knots, is considered the most suitable wood. The 'back or union bow,' is made of two, or sometimes three pieces, glued together. The *back piece*, or that furthest from the string, is of rectangular section, and always of lancewood or hickory; the *belly*, which is nearly of semi-circular section, is made of any hard wood that can be obtained straight and clean, as ruby-wood, rose-wood, green-heart, king-wood, snake-wood, and several others: it is in great measure a matter of taste, as the elasticity is principally due to the back piece; the palmyra is also used for bows." p. 31.

"Elm is perhaps the toughest of the European woods; it is considered to bear the driving of bolts and nails better than any other, and it is on this account, and also for its great durability under water, constantly em-

ployed for the keels of ships, for boat building, and a variety of work requiring great strength, and exposure to wet.

"The lignum vitæ is a most peculiar wood, as its fibres seem arranged in moderately thick layers, crossing each other obliquely, often at so great an angle as thirty degrees with the axis of the tree; when the wood is split, it almost appears as if the one layer of annual fibres grew after the manner of an ordinary screw, and the succeeding layer wound the other way, so as to cross them like a left-hand screw. The interlacement of the fibres in lignum vitæ is so decided and rigid, although irregular, that it exceeds all other woods in resistance to splitting, which cannot be effected with economy; the wood is consequently always prepared with the saw. It is used for works that have to sustain great pressure and rough usage, several examples of which are given under the head of Lignum Vitæ in the catalogue." p. 33.

The animal substances employed by the turner are not numerous, and consist of ivory, horn, bone, and shell; but the working of them by the turner requires, in general, considerable skill. Of the manner in which our author has treated this portion of his subject, our limits prevent us from giving more than one example.

"As an illustration of the peculiar properties of horn, and a mode of its employment in the lathe, may be mentioned the expanding snake. This toy is known to consist of a conical piece of horn, the one end of which is carved to represent the head, and the remainder is cut into a single spiral shred, so as to admit of great expansion, in imitation of the body of the reptile. I find the elastic portion of the one before me to measure, when compressed, barely one inch and a quarter in length, and that it expands to upwards of three feet and a half, or thirty-five times: no mean proof of the elasticity of the material.

"In making this trifle, the material is turned to a conical form, after which a hole of about one-eighth or one-sixth of an inch diameter is pierced from the tail almost through the head; the horn is then soaked for about two days in cold water to soften it, and the spiral incision or screw is made at one single cut, by means of a tool extending from the centre to the circumference; the cutter is not required to be very thin, as the shaving will bend away to make room for the same." p. 124.

The mineral substances employed by the turner are either earthy or metallic. The former, to which class marble, fluor-spar, jet, precious stones, and many other common materials belong, are used in their natural state; but the metals are submitted to a variety of preparatory processes. These are described by our author, as well as the formation of alloys. The portion of his work devoted to a description of the metals, and the modes of working them, is too varied in its subjects to admit of our introducing even an analysis of the contents; but founded as it is, upon reading, observation, and practice, it cannot fail to be valuable as a judicious guide to the process of preparing and working metals. The examples are also well chosen, and would be interesting to even more general readers than those to whom it is addressed.

The style in which this volume is written is creditable, and for the most part perspicuous; the arrangement good, and the information correct. The wood-cuts are for the most part outlines, and are not always such as could be commended—more attention to them would be desirable; but both in its contents, and in its appearance, this volume is worthy of praise; and if the succeeding ones are prepared with the same care, we hope that Mr. Holtzapffel will not be disappointed in his expectation of public support.

HERNE BAY PIER.

This noble pier was designed by Telford, and completed in the year 1832; but the wooden piles being unprotected, all the parts in deep water have been eaten away by the worms. The restoration of the pier has been going on for some months under the direction of Mr. W. M. Higgins, the Company's engineer, and all the external piles, so much injured as to require restoration, have been drawn and replaced by new timber piles, scupper-nailed to the height of three feet above low-water mark. This work has been attended with great difficulties, for, from the construction of the pier, it was necessary to draw the old piles and drive the new ones in their places. In consequence of the piles being reduced to two or three inches in diameter, but few were able to bear the strain in drawing, and the attachment of the chains to the stumps, at first greatly impeded the progress of the works. The difficulty was also increased by the impossibility of placing any considerable strain upon the pier itself without great danger to the fabric. These restorations, however, have been made without closing the pier for a day. The interior piles still remain to be restored, and it is Mr. Higgins's intention to adopt cast-iron socket piles, which will stand about six feet above low-water mark, and be connected with the longitudinal pieces by short timbers fixed in the sockets, and bolted to the iron piles. It is much to be regretted that so noble a structure should have been constructed with so little foresight, and it is difficult to believe that the certainty of a speedy destruction can have been unknown to Mr. Telford, who was well acquainted with the effect of the worm upon timber on the south-eastern coast of England. The present restoration, however, will place the work beyond the reach of future danger from the same cause.

ON LIGHTNING CONDUCTORS.

Our readers cannot fail of being interested in a subject so closely connected with architecture as the erection of safeguards against lightning; but will be glad to find that the theory of their construction in reference to the vicinal metals, which necessity at times has placed near them, has been just submitted to a very close investigation by Mr. Walker, the Secretary of the Electrical Society, who read a memoir on the subject to the Society, on Tuesday, the 20th December. The question, to which a decisive answer has not yet been given, is this:—Should the metal roofing, gutters, pipes, &c., be, or be not in connection with the lightning rod? Some electricians hold that they should, others that they should not. The question resolves itself into another;—Is there, or is there not, danger of sparks passing from the rod itself to such bodies? If there is, the metallic connection should be made; if there is not, it need not. This question again resolves itself into so many elements, that it requires all the skill of an electrician to trace their bearings on each other and on the main question. An important stage of the enquiry has been to show the immense difference there is between the Leyden discharges, commonly employed to illustrate lightning, and the actual phenomena itself; and these hold so great a *degree* of influence over the ultimate effect, as to prove that our puny experiments are *in minimis*, what those of nature are *in maximis*. The *distance* of the clouds, and the great area of the earth, are points dwelt upon to much extent; from which is deduced the important fact, that the cloud not only contains immensely more electricity than is induced on the infra-posed earth; but also, that if a flash passes, equivalent to compensate the induced condition of the earth, on reaching the earth, a portion of it is converted into free electricity, not required to saturate the earth in its *then* condition, in consequence of the inductive action of the electricity still left in the cloud. Formulæ are given to express the value of these several elements; and the free electricity, which Mr. Walker terms "induced residual," is shown to be very great in amount. A systematic investigation of the dispersion of this "induced residual," and also of the compensating portion of the flash, is here given, illustrated at every

stage by several recognized, and many new experiments, strengthened, too, by the testimony of the first electricians, and the records of actual cases in point; all of which lead the author to conclude, that it is not safe to allow metallic bodies to be near a lightning-rod; but if they must be there, they ought to be connected with the rod itself. The author shows several points of theory in which he does not coincide with Mr. Snow Harris; but proves that in a practical point of view, so far as *copper-bottomed* SHIPS are concerned, Mr. Harris's conductors, as adopted for the protection of the British navy, are as good as ingenuity and science could devise.

REPORT ON THE PRESENT STATE OF THE NORMAN TOWER (COMMONLY CALLED ST. JAMES'S TOWER), BURY ST. EDMUND'S, SUFFOLK.

BY L. N. COTTINGHAM, ESQ., ARCHITECT.

London, December, 1842.

To the Churchwardens of the Parish of St. James's, Bury St. Edmunds, Suffolk.

GENTLEMEN,

CONFORMABLY to the instructions furnished me by Charles Hinnell, Esq., your vestry clerk, on the 4th of June last, requesting me to inspect and report on the state of the St. James's tower, and whether it might be so repaired as to render it safe to ring the bells therein, and also on the nature, extent, and expense of such repairs, I beg to acquaint you, that, with the assistance of proper workmen to remove the accumulated earth from a part of the footings of the walls, and take out a great mass of unsightly brickwork and rubbish, with which various apertures in the original masonry have been closed up, I am enabled to lay before you the following remarks on the present state of the fabric, and the expense of its restoration.

This tower having peculiar claims on the public attention as a work of art, I beg leave to preface my remarks on its present condition by a few observations on its merits as a specimen of Norman architecture, and the history of its erection.

It has been very justly observed by an eminent historical writer, that "Mankind in general have naturally a propensity to admire every thing relative to the antiquities of ancient buildings." Nay, perhaps there is not a clown to be found in the neighbourhood of an ancient monastery, castle, &c., however rude in his manners, but evidently shows an inclination to become acquainted with its history, especially if it has been the scene of any memorable transaction. It may, therefore, readily be conceived that the threatened dissolution of the Gatehouse Tower, at Bury St. Edmunds, should have excited a great degree of interest throughout the county of Suffolk, as well as other parts of the kingdom, presenting, as it does, a noble specimen of pure Norman architecture, in all its chastened beauty, its solemn dignity, and grand simplicity. Invested with the hoary crown of nearly eight centuries, it still presents an unaltered form on its exterior faces. Nothing can be more simple, yet nothing more truly imposing.

Erected at a period when the rounded arch, originally introduced into this country by Saxon pilgrims from Rome, had, in the master hands of the Norman architects, left the debased trammels of the Roman imitation, and established a style of architecture in which the semicircular arch was made to combine in perfect harmony with every element of construction—what a proud specimen of this new style of architecture is the tower in question, where we see such a striking difference from the Egyptian, Grecian, and Roman, as to make us instantly hail it as a new mode of architecture, capable of being carried out with every luxury of ornament, durability of construction, and vastness of design.

Had the magnificent church to which this portal led been spared, enough would have been found in Bury alone to have formed a complete school of design in this grand style. However, deplorable as the loss of such a noble specimen of ecclesiastical building must be to every antiquary and artist, it is some satisfaction to live at a period when a decided taste is daily evinced for the preservation of the remains of our national antiquities. It is true we are not yet able to rival the builders of these sublime edifices, but there is some hope, even in the humiliation which we must all feel, when we sit down to study the wonderful science displayed in their construction, the exquisite beauty of their details, and the picturesque effect of all their arrangements.

It is to be regretted that no written document of the period exists, by which we can at once learn the exact date of this building, or the name of the architect, but in the absence of such interesting records we must not place too great reliance on traditionary accounts, which generally, in such matters, carry us back to a much earlier period than the subjects warrant. In the reign of Alfred, and down to the middle of the eleventh century, there were undoubtedly many cathedral, monastic, and parochial churches, built of stone, in various parts of the kingdom, remains of which are still in existence, but I do not think that any of the cathedrals were of sufficient magnitude to meet the views of the Norman architects and prelates.

The small size of the Saxon buildings compared with the edifices known as the Anglo-Norman, and erected for similar purposes, as well as the immense variety of fanciful decorations in the mouldings and capitals, will, on a close inspection, show a material difference in the two modes; besides, the Normans had established a decided style in their own country before the conquest, which event afforded them the means of realizing and fully carrying out their grand conceptions, for in magnitude of designs the Normans very far exceeded their predecessors, the Saxons, and entirely shook off the Roman proportions and mouldings.

There is a great similarity in the mode of construction and decoration between the Bury tower and the tower at Norwich Castle, built by Hugh Bigod, in the beginning of the twelfth century; there are also many portions of the decorations of the tower of Norwich Cathedral so closely corresponding with the Bury gateway as to leave little doubt of their being built at the same period, if not designed by the same architect.

It is a most fortunate circumstance for the revival of our national architecture that a certain impress or stamp is given to the minutest fragment of a moulding or vestige of enrichment, so as to mark the era of the building, and enable the architect to restore or design with certainty, and the antiquary and historian to record with truth.

How truly desirable and honourable is it then to preserve the time-honoured remains from total destruction, for when the perishable manuscript is lost, and all record gone, a single capital or base of a column, a small fragment of foliage or moulding, a carved shield, or corbel head, may serve to fill up an hiatus in the page of history, and revive the memory of many a worthy of the "olden times."

The tower is 40 feet on the ground or entrance story, from east to west, including the porch attached to the western entrance, 37 feet 6 in. from north to south, and 82 feet 3 inches high; the walls are 5 feet 10 inches thick, from top of the foundation to the raising plate of the roof. The parapet is 1 foot 10 inches thick, the walls are faced with plain ashlar, about 8 inches thick inside and outside, and the core filled in with rubble work, consisting of flints and stone chippings, grouted with lime and sand.

It consists of four floors or stages of building; the ground floor is 23 feet 9 inches square inside the wall, and 26 feet high; this formed the passages of entrance to the Old Abbey Church-yard, through a pair of folding oak doors, hung within a deeply recessed and widely spreading archway, supported by columns on the west, with a flat inner arch (now removed) for the doors to shut against, and a clear archway in the thickness of the wall with clustered columns on the east.

A postern doorway, 6 feet high and 2 feet 10 inches wide, has been discovered in the south wall, with a step 10 inches above the original pathway. The old iron hooks, on which the door was hung, are still in the eastward stone jaumb; a mortice for the bolt of a lock is in the opposite jaumb; the door opened outwards in the thickness of the wall.

There is a circular stone staircase inside the square pier at the north-west angle of the tower, which is entered from the outside through a narrow doorway in the north wall, just within the line of the ancient boundary wall. The ground has accumulated in this story 5 feet 6 inches above the original entrance level; there must, therefore, have been an external flight of steps up to the doorway of the narrow passage in the north wall which leads to the staircase.

The second story or chamber over the gateway is 23 feet 8 inches square, and 22 feet 6 inches high; it is entered through a small doorway in the centre of the west side, which is approached through a narrow gallery in the thickness of the wall, lighted by two small Norman windows, divided by clusters of columns. There is no appearance of these windows ever having been glazed.

The floor is formed with seven oak beams, about 12 inches by 10 inches square, laid on the walls from north to south, and strengthened by short oak strutts under the ends. These beams were designed to have a bearing on the wall of 18 inches at each end, resting on the ashlar, and an oak plate built in the wall at the back of the ashlar; 16 plain wrought chasings or housings are made in the masonry to receive the ends of these beams, which, in case of decay, would allow of their being restored without pulling the wall to pieces.

The floor boards were of 1¼ inch oak. The room is lighted by four deeply splayed circular headed windows, two being in the east wall with a heavy stone pier between them in the centre of the wall, and one on each side at

the east end of the north and south walls; there are two narrow openings through these walls near the west end, with eight stone steps in each, which leads down to the watch and ward gangway on the ancient boundary wall north and south of the tower. This room was probably called the guard chamber of the gate-house

The third story is entered from a narrow passage in the north wall, communicating with the staircase at the north-west angle: it consists of a single room 23 feet 8 inches square, and 16 feet 6 inches high. It is lighted by twelve windows, three on each side of the room; the floor is composed of oak beams built into the masonry of the east and west walls; the boards are of deal and oak of various thicknesses.

The fourth story, in which ten very fine bells are hung, is a single room 23 feet 8 inches square, and 12 feet high. The floor joists are 5 inches in depth, resting on the north and south walls, and supported in the centre by oak framing, which descends into the second story. This room is lighted by twelve windows, 3 on each side, and is entered by a step-ladder from the floor below.

The roof is a modern one, built of fir timber, hipped and slated with a lead flat, 7 ft. square in the centre. The lead gutters are wide, and form a good passage-way round the embattled parapet wall, which is 5 feet high. On the lead flat, in the centre of the roof, is a modern bell turret, covered with lead, which rises 20 feet above the roof.

The stone used in this building is a coarse shelly limestone, brought from the Barnack-mill quarries, in Northamptonshire. It has been very extensively employed in churches throughout Lincolnshire and Cambridgeshire, and parts of Norfolk and Suffolk, and from the state this tower is in, may be considered a good building-stone.

Having made the above remarks on the design of the building, its antiquity and great value as a work of art, I next proceeded to ascertain the depth of the walls below the level of the present roadway, which I found to be about 5 ft. 6 in., standing upon a rough foundation, composed of large stones and stone chippings, grouted together with lime and sand, upon a loose gravelly stratum. Some desperate liberties have been taken with it by digging the cellars of those monstrous excrescences, yclept houses, which are attached to the north and south-west angles of the tower, to the great injury of the beautiful entrance front. The main timbers of the house, which hangs on the north-west angle, are actually infixed two feet into the stone wall, so that a restoration of the masonry on the north side of the tower must occasion the downfall of that building, which is already in a very crazy state. The house at the south-west angle is equally injurious to the effect of the tower; several of the timbers rest on the tower walls, and every part of the building above the level of the ground which is attached to the tower, is built with timber, lath and plastered, so that if a fire were to happen in either of these dwellings, this noble tower would inevitably fall a sacrifice to the sordid encroachments that have been made upon it.

Eastern Front. It appears that about twenty-five years ago a portion of the eastern archway fell down soon after the ringers had finished a peal on the bells, in consequence of which steps were taken to repair the damage. The arch, which was composed of a series of cable mouldings neatly jointed in small and separate stones, was repaired, but differently to the original mode, one of the new stones occupying the space of three or four of the old ones. The windows in the third story, and some of those in the fourth, or bell chamber story, were bricked up with double 9-in. walls, and brick arches, turned under the soffit of the original stone arches, and wedges of iron and slate driven in between the old and new work. The cavities or pockets formed by the brick walls, were filled in with a mass of dry rubble.

Nothing could have been more injudicious or destructive to the future stability of the fabric, than this most ill-judged performance. The disruptions in the walls over the haunches of the arch, which had slightly appeared before it gave way, were much increased by that accident, and greatly promoted by the weight added, in closing the apertures and wedging them out of their natural balance; the great distortions of the arches and string courses, and the broken and disjointed ashlar which presented itself to view, was left without any remedy being tried to secure it, beyond mere stopping up the face of the joints and fractures with compo, and driving in bits of bricks, tiles, and iron wedges; consequently, the fissures have increased to such a frightful extent, that the arch is now in danger of being crushed, a greater weight having been thrown upon its crown, than the slender cable mouldings of which it is composed are capable of bearing. This is evidenced by the buckling and twisting of the arch out of its original curvature, and by the splitting and shivering of several of the arch stones; the bed-joints, also, of the ashlar, inside and outside, dip down several inches out of the level at the top of the arch; and the disruption of the wall over the haunches on each side being entirely through the wall, the whole body of the masonry over the centre of the arch now acts as a powerful wedge against the main piers or angles of the tower, which have thrust the south-east pier nineteen inches out of an upright towards the south, and the north-east pier four inches towards the north. In fact, this arch *is* now something like an overloaded hoop, when its ends only are fastened. The foundation of the south-east pier, which is composed of flint rubble, in coarse mortar, is a little sunk, but not sufficient to disturb the superstructure, much less occasion the extraordinary overhanging which has taken place at this angle of the building. This induced me to examine minutely the mode of hanging the bells. They are hung in the fourth, or upper story, and the main beams which support the oak bell-frame, are built into the north and south side walls. The ashlar on which these beams rest, is shaken to pieces, and the walls so far injured as to leave no doubt on my mind that the ringing of the bells has been the main cause of the great injury the tower has sustained. This is further evidenced by the introduction of additional supports from time to time, to arrest the progress of the injury, but the tower was so far shattered by the vibration, occasioned by the ringing of a heavy peal of ten bells, before any steps were taken to secure the masonry, that I have no hesitation in saying that the eastern wall and arch have been in great danger of falling every time the bells were rung, not so much from the weight of the metal, as from the bad position of the main timbers, they being built into the wall so near to the top of the tower, that every swing of the bells exerted a powerful thrust against the walls, which, not being thoroughly bonded, they could not withstand.

I am of opinion it will be advisable to fix a strong timber centre under the main arch of this front, according to the drawing No. 1; and that the three tiers of cast iron chain ties, as shown in the drawings, No. 2, 3, and 4, should be inserted previous to any portion of the dislocated masonry being removed, or even disturbed.

The parapet wall, and weather table above the upper tier of windows, must be taken down and re-built. The arch stones of the windows and string courses must be partly reset; the defective ashlar, inside and out, where the walls are ruptured, must be taken down and rebuilt, and the cracks in the rubble core grouted up solid as the repairs of the ashlar proceed.

(To be continued.

EFFECT OF LEAVING A SPACE BETWEEN THE POWDER AND THE TAMPING IN BLASTING OPERATIONS.

In the article on Blasting, which appeared in last month's Journal, we adduced the opinion of Mr. Roberts to the effect that "the force of gunpowder is some thousand times greater with a small space above it, than when no space is left." We regret that in this expression we have somewhat misrepresented Mr. Roberts, as in effect he is here made to say that the force of the gunpowder is some 1000 times greater in the work of blasting the rock, which is obviously more than is meant. The real opinion to which we have been authorized to give the sanction of Mr. Roberts's name is this, "that the resistance opposed by the tamping, or the force by which it resists the power of the gunpowder to blow it out, is some 1000 times greater with a small space between it and the powder than when no space is left."

METROPOLITAN IMPROVEMENT COMMISSION.

Sir Robert Peel has, according to the request of the Metropolitan Improvement Society, appointed a commission "to consider, on comprehensive principles, the various plans which have been suggested for the improvement of the metropolis. The commission will not have authority to undertake plans of improvement, or to enter into engagements with respect to them; but they will be enabled to investigate the merit of the various proposals that have been under consideration, to estimate the charge of effecting each improvement, to compare that charge with the probable revenue to be derived from it, and to consider the bearing of each detached scheme, not only upon the immediate vicinity, but upon the general convenience and health of the metropolis, and the means of facilitating communication between the various parts of it." The commission is to consist of the Lord Mayor; the Earl of Lincoln; A. Milne, Esq.; Hon. C. A.

Gore; Lord Lyttleton; Lord Colborne; the Right Hon. J. C. Herries; Sir R. Inglis, Bart., M.P.; Sir C. Lemon, Bart., M.P.; Sir R. Smirke; H. T. Hope, Esq.; H. Gally Knight, Esq. M.P.; and C. Barry, Esq.

We always thought the Metropolitan Improvement Society a useless body, and incapable of doing any mischief. But the very incapability of the Society has induced its committee to draw into existence a commission which must be jealously watched by the profession. We prophesy that jobbing and jobbery will be the order of the day. Patriotic feelings, and a regard for the poor, are specious arguments, and will cover a multitude of sins. Much may also be made of the disinterestedness of men who devote their time to public objects without pay. But in spite of all this, the commission will not require many months' existence to prove that it is a job. We shall watch its proceedings with jealousy, and have taken this early opportunity of cautioning the profession. It is much to be regretted that Charles Barry has allowed his name to appear among the commissioners; but the association with nobility and *taste* was not to be rejected.

MISCELLANEOUS.

FLOATING BREAKWATER.—Captain Grove's experimental floating caissons, or breakwater, which has now been completely fitted in all its appointments, was on the 3rd Dec. hauled down on the beach, preparatory to its being floated off to the front of the harbour. A government lighter and a steamer are employed in assisting the operations of Captain Grove; and it is expected the ponderous machine will be moored in its place this day. Much interest is felt for the result of the experiment. When it shall have been fairly anchored, it will not be long in being tested by 'the tempests' high seas and raging winds,' which generally beat our shores at this season of the year.—*Dover Chronicle.*

SUNDERLAND FLOATING DOCK.—The commissioners of the river Wear have resolved upon a plan for the conversion of the harbour of Sunderland into a floating dock, for which notices have been given, and an application will be made to parliament for an act in the next session. Mr. Murray, the resident engineer of the dock pier and harbour, is now, we believe, in London, consulting some professional gentlemen on the plans. A most influential public meeting of shipowners has been held, Mr. W. Nickinson in the chair. The feeling of the meeting was unanimously in favour of the work, but it was thought desirable that a committee should be appointed to watch the proceedings of the commissioners. Should the present plan be carried out, the channel of the harbour will be deepened, and the damage to the shipping, so frequent and so extensive, will be avoided. By the breaking up of the ice in 1841, the damage was very great, being estimated at £20,000. The cost of the proposed works is estimated at £60,000. and to meet this an additional due of 1½d. per ton per voyage will be laid upon the shipping.

BROADWAY CHURCH, WESTMINSTER.—Considerable progress has been made in the erection of this building. The committee have, however, now resolved to add a tower and spire upon a scale suitable to the rest of the building, and are anxiously seeking additional contributions to effect that desirable object. The design is creditable to the taste of Mr. Payuter, the architect.

TOMB OF NAPOLEON.—The French papers mention that the construction of the tomb of the Emperor Napoleon is about to be commenced; and that for the last few days a model has been exposed to public view in the Invalides. An equestrian statue of the Emperor is to be placed in the middle of the great court, and on the pedestal will be represented the arrival of his ashes at the place where they now lie. The entrance of the crypt destined to receive the Emperor's mortal remains, will be ornamented on each side by two gigantic statues, and two lions couchant. This entrance will be surmounted with an altar on spiral columns. The present grand altar, and its rich canopy, must be removed to admit of this arrangement.—*Athenæum.*

TESSELATED PAVEMENT.—In taking down the *Bear* public-house, in Colchester, a fine tesselated pavement has been recently discovered. This spot was, therefore, once the site of a Roman building of considerable extent and importance.

ST. MARY'S, NOTTINGHAM.—The father of the venerable Archdeacon Wilkins, the present incumbent of St. Mary's, Nottingham, prophesied some years since, if we remember rightly, that the noble tower of this beautiful church would fall within a quarter of a century. Some alarming indications of this dreaded event have been recently observed in the failure of one of the piers, by which the tower is supported. The church is therefore now closed, and Mr. L. N. Cottingham has been engaged to report upon its present state, and the course which should be adopted to sustain the structure.

THE NEW HALL AND LIBRARY OF LINCOLN'S INN, as designed by Mr. Hardwick, are to be shortly commenced. The face of the work is to be of deep red brick, with stone dressings.

WELLS CATHEDRAL.—Mr. Cockerell has been engaged by the Dean and Chapter of Wells, for the restoration of the Cathedral. Some journalists seem to anticipate that it has fallen into wrong hands, and that Mr. Cockerell is only capable of undertaking a Grecian or Roman building. We entertain no such fear; the admirable taste, elegance, and invention of this architect, are the best qualities for such an undertaking; and of his eminent success there can be no reasonable doubt.

NEW ROMAN CATHOLIC CHURCH.—It is intended to build a new Roman Catholic Church for the eastern part of the metropolis. The site chosen is a large piece of ground on the south side of the Commercial Road, and contiguous to the Dispensary; and it is expected that the total cost of the edifice, and the purchase of the ground, will not fall short of 30,000*l.* The ground has been purchased for 300*l.*

PEDIMENT OF THE ROYAL EXCHANGE.—The Gresham Committee has voted 3,000 guineas for ornamenting the pediment of the Royal Exchange, and have chosen a design by Mr. Richard Westmacott. A.R.A. which that excellent sculptor has engaged to complete by the 1st of May, 1844.

A PROFESSORSHIP OF CIVIL ENGINEERING has been established at Trinity College, and Mr. J. Macneill has been elected to the chair.

ARTESIAN WELL, BRIGHTON.—A curious experiment is now being made at the head of the Chain Pier, Brighton, that of raising fresh water from below the ocean by means of an Artesian well. It is intended to bore to the depth of seventy feet, at which depth the chalk formation will, it is expected, be penetrated, and fresh water be obtained which will be applied as a jet-d'eau.

SOUTHEND PIER.—Government has, we are informed, advanced money for the completion of Southend Pier, and the work has been placed under the management of Mr. Simpson, who is now preparing the drawings and making arrangements for the immediate performance of the work.

TO CORRESPONDENTS.

The article of "A Mason of the Church," was condemned by the Editors, and ordered to be erased before his letter arrived. Such violent abuse and egregious puffery will certainly never find a place in this Journal under its present management.

Mr. Denton has our best thanks, and we regret that in consequence of an accident in the printing-office, the article he has furnished must be delayed till the next number.

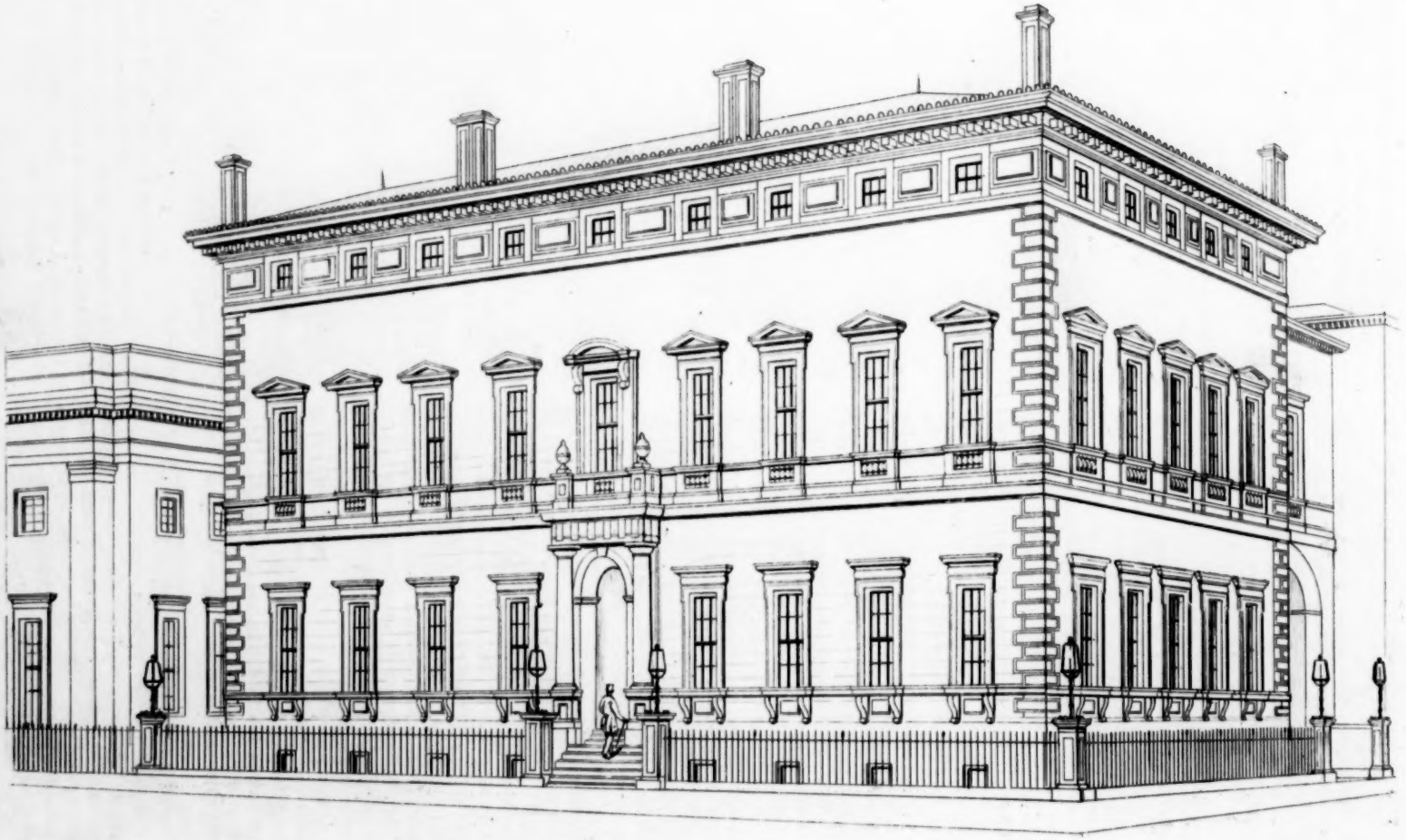
"Geoffrey of Monmouth."—We are anxious to recommend Mr. Giles's edition of this old historian to our architectural readers; but the work was received too late for review in the present number.

The communication from Sunderland has not reached us.

"S. T., Cambridge." It is our intention to examine the pretensions of the architectural societies at an early opportunity; and to bring before the profession and the public, the objects they have really in view; for we have a strong suspicion of ulterior, though now hidden, motives.

ATHENÆUM, MANCHESTER.

C. BARRY, ARCH.T



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I.Dower Sculp.